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Unusual River Dredging Operation

Pioneer Sand Co., St. Joseph, Mo., Uses
Suction Ladder Mounted on Side of Hull



General view of dredge, showing method of mounting new pontoon and ladder

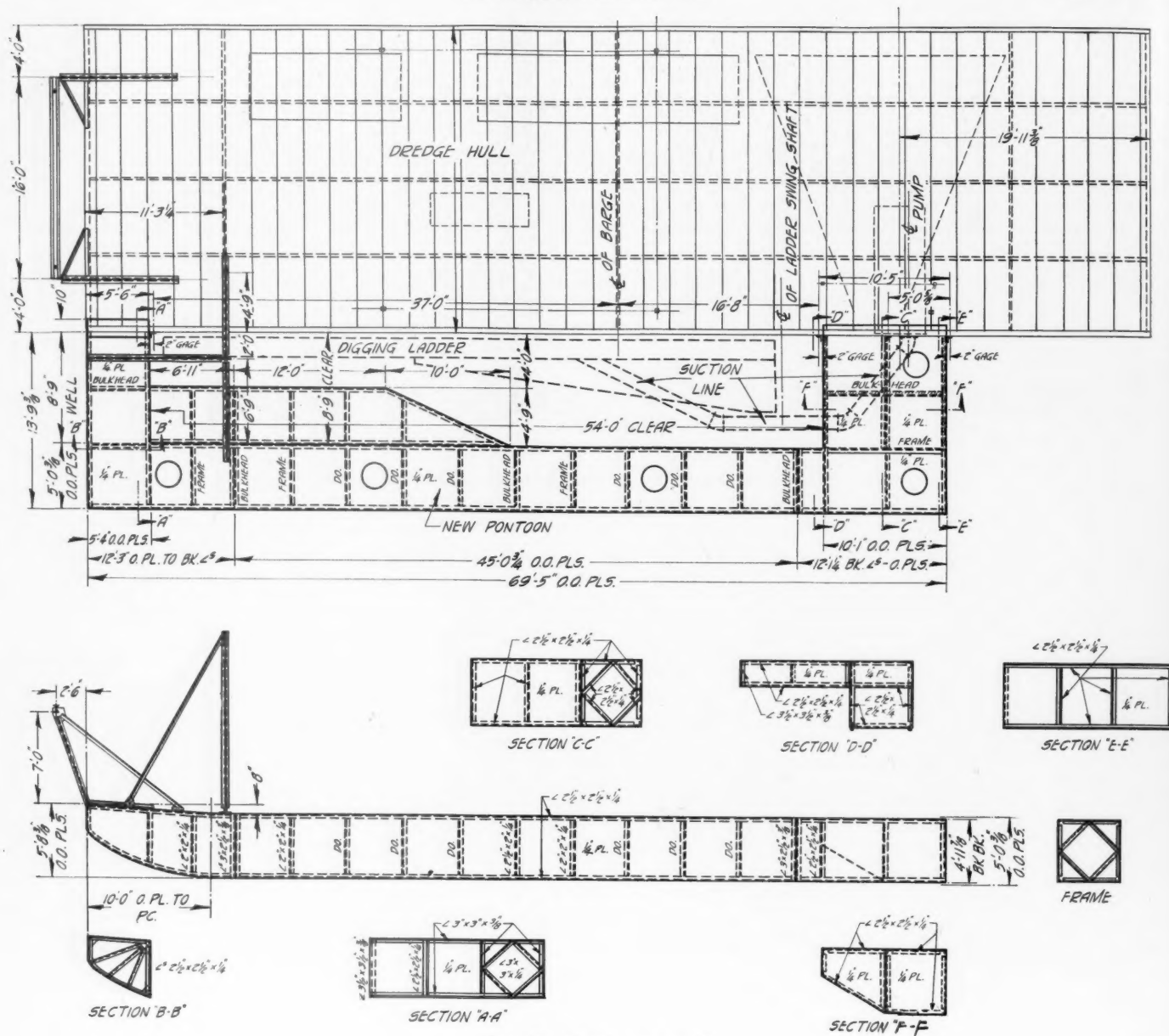
THE PIONEER SAND CO. of St. Joseph, Mo., under the direction of its general manager, Capt. R. J. Stewart, recently made a radical change in the method of installing a screen nozzle ladder on its dredge. In the new design the suction ladder has been mounted on the side of the dredge instead of at the end, which is believed to be the first installation of this kind in the industry and which method of mounting will probably lead to its adoption by other operators when its advantages are learned.

The main reason for mounting the ladder on the side in this particular instance is found in the conditions under which

the dredge has to work, as the swiftly moving waters of the Missouri river at St. Joseph would probably shear off any pontoon or ladder support affixed to the end of the dredge. The dredge itself is 85 ft. long, and mounting a ladder on the front end would mean in this case an additional 70 ft. or a total length of about 155 ft. Handling a boat of this length in such swift water would present serious difficulties and an unusually strong design would be necessary for the connection between the boat itself and the pontoons carrying the digging ladder.

While the above may possibly sound

overdrawn or exaggerated, still the hazards of river navigation at St. Joseph, when considering floating equipment, are so great that one insurance company requires as a yearly premium approximately 20% of the total value of the craft. Thus increasing the length of the dredge and thereby making it harder to handle might offset any advantages to be gained from the use of the ladder. But because of the character of the river deposits a cutterhead or ladder in connection with the suction was very much to be desired and so the installation was made in the way mentioned, with most satisfactory results from the standpoint



Details of new pontoon

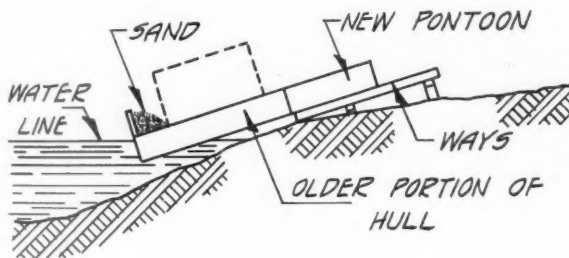
of capacity, economy and ease of navigation.

Considering that the company produces only sand and no gravel it might be asked, "Why have a cutter at all when digging in a river sand deposit?" The answer is that a considerable amount of tree branches, logs and other debris is carried down by the waters of the Missouri river and that the sand deposits are not only mixed with this debris but are, at the same time, packed to a surprising degree. According to Capt. Stewart, the installation of the digging ladder has increased production at least 33 1/3% on the average and on many days as much as 50 to 60%. The dredge operator was even more liberal as to the percentage increase, stating that he now often loads a 165-ton barge in 30 min., whereas previously an hour to an hour and one-half has been required.

The successful outcome is due entirely to Captain Stewart, who with-

out any outside encouragement but with his knowledge of river conditions, navigating problems and the sand business, worked the matter out according to his own ideas and obtained satisfactory results.

The dredge itself was built several years ago by the Missouri Valley Bridge and Iron Co., Leavenworth, Kan., and has a steel hull 85 ft. long by 24 ft. wide and 5 ft. deep. The sand is pumped by a 10-in. Amsco centrifugal pump which is belt driven from a 65-hp. steam engine. Steam is provided by an 80-hp. boiler.

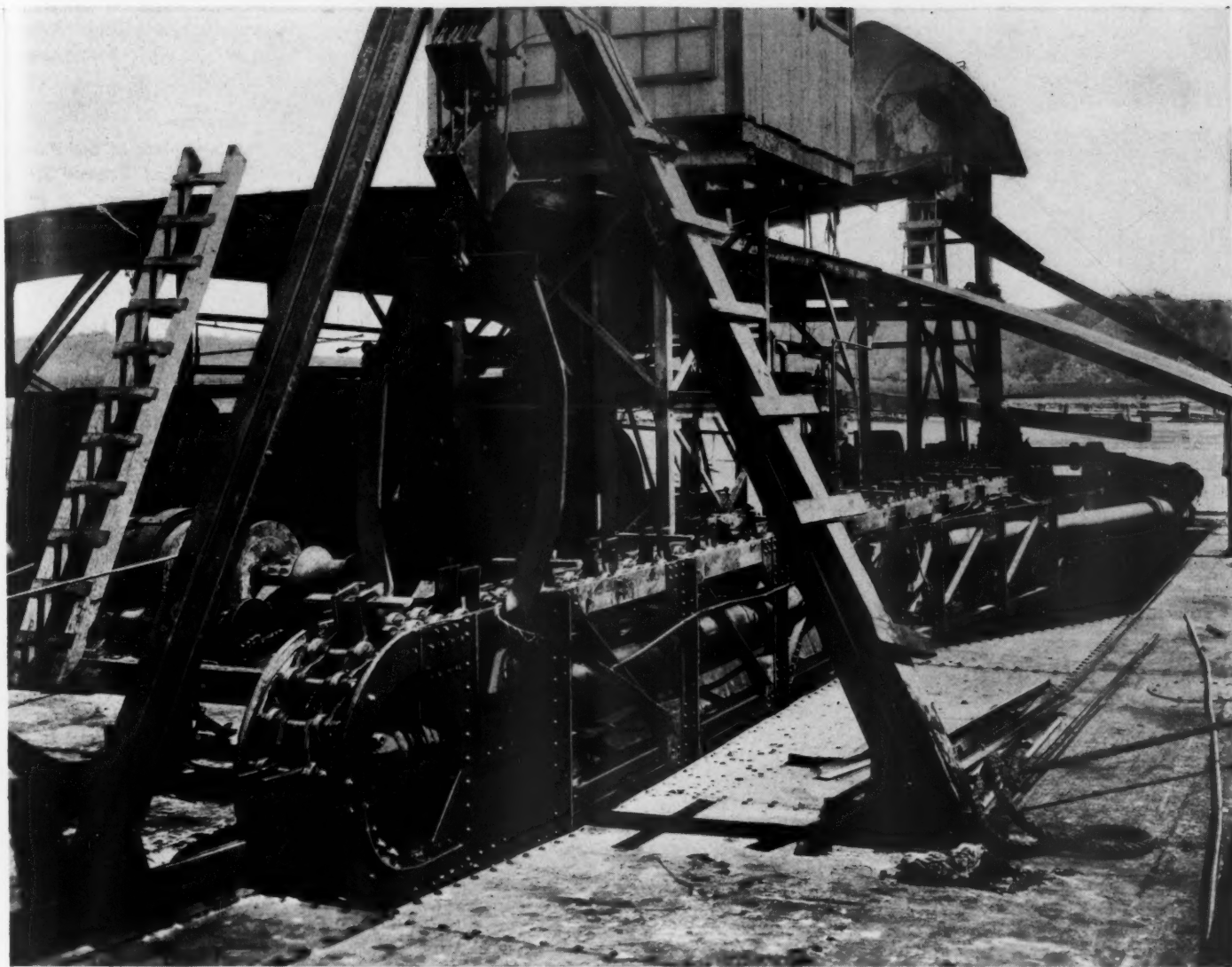


Method of launching hull

A 50-ft. "Eagle" Swintek ladder was added and this is driven by a small vertical steam engine. In order to mount the ladder on the side of the dredge hull a pontoon was designed and was built by the Missouri Valley Bridge and Iron Co. This pontoon was a trifle over 69 ft. long and not quite 14 ft. wide, with the front end shaped like the front end of the hull of the dredge. The detail dimensions as well as the manner of attaching it to the hull of the dredge are shown in one of the accompanying drawings.

This pontoon was shipped in sections and assembled at St. Joseph.

After the pontoon had been assembled the dredge was pulled up out of the water far enough so that the new pontoon could be first riveted to the dredge hull and then electrically welded at all joints. Fastening the pontoon to the side of the dredge in this way served to strengthen and stiffen both the pontoon and the hull and also made navigation easier than



Ladder in raised position, showing ease with which work may be done on it

if it had been attached to the end of the hull.

When it came to installing the suction line on the ladder, another change from common practice was made. Instead of coming into the pump with a 90-deg. elbow and with the suction line following the ladder on the side next to the pump, the line was carried around the driving gears of the ladder and down the opposite side of the ladder. This was done so as to keep the digging ladder as close to the hull as possible and thus obtain

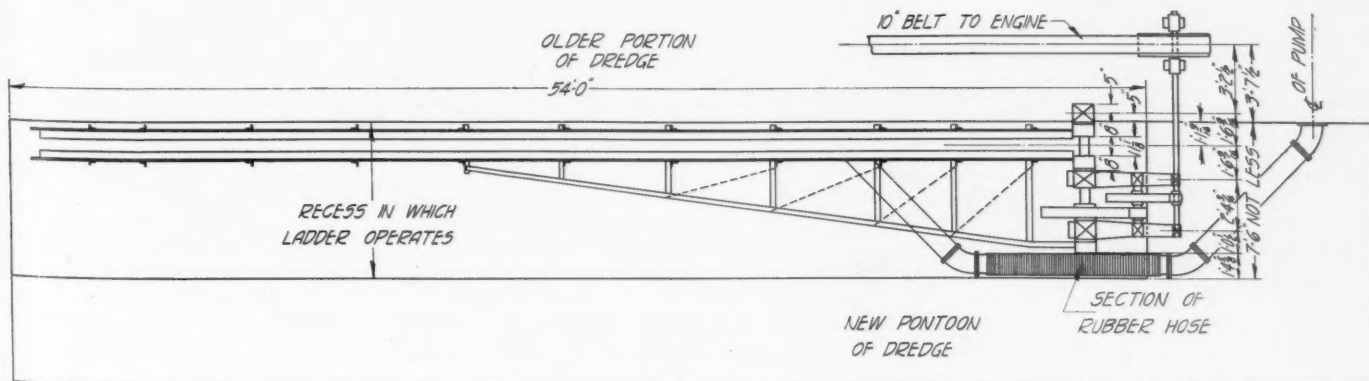
greater compactness and rigidity. At the same time this arrangement eliminated a sharp elbow in the suction line. This change is expected to result in a lower operating cost. Flexibility of the suction line at the point where it goes to the ladder is secured by the use of an 8-ft. length of suction hose made by the Cincinnati Rubber Manufacturing Co.

Launching Was a Problem

The launching of the craft after the

addition of the new pontoon was another problem as it was feared that when the new hull was launched sideways into the water, the pontoon might be sheared off or the hull buckled. Hence to guard against this possibility about 40 yd. of sand were piled along the outer edge of the dredge hull prior to launching. This was piled as close to the edge of the hull as possible and held in place by a fence-like structure of light boards.

When the boat was launched, the lower



Ladder details



Tugboat "Robert J. Stewart" and barge

side carrying the sand ballast had sufficient weight to cause it to slide into and under the water sufficiently so that the entire structure hit the water in an even plane and the lower end of the hull was under water.

The instant the craft was all in the water the wires holding the board wall were cut, allowing most of the sand to wash into the river and the hull to assume its normal position.

Cost Was No Greater Than Customary Method of Installation

The first cost of the installation was about the same or at least no greater than the more conventional method of mounting at the end. Aside from the features of greater strength the new design greatly simplifies repair work on the lower end of the digging ladder. In this case the ladder can be raised to a horizontal position and all work can be done from the deck of the dredge, which contrasts quite strongly with the difficulties of repairing the lower end of the digging ladder on the end-mounted types, where such repairs often have to be made from a boat.

The sand from the pump is discharged to an inclined stationary wire screen with $\frac{1}{2}$ -in. by $1\frac{1}{2}$ -in openings and any over-size, consisting mostly of wood trash, clay balls or an occasional piece of gravel, is wasted overboard.

The screened sand passes down an inclined spreading table from which the material falls to a second inclined stationary screen which is 4 ft. high by 20 ft. long and provided with 14-mesh screen cloth. The fines from this screen are also returned to the river and wasted, while the material passing over it goes to a launder suspended over the barge to be loaded. This launder or chute has four small hopper-like outlets equally spaced along its bottom, and these act as small sand settling cones. The discharge from each cone is hand regulated so that a steady stream of clean sand falls from each cone to the barge with the excess water and fines passing to the end of the launder and discharging back to the river.

Another Boat Launched Last Year

Last year the Pioneer Sand Co. placed in operation a new tug boat, the *Robert J. Stewart*, which is said to be one of the best on the Missouri river. This steamer was also built by the Missouri Valley Bridge and Iron Co. and is 100 ft. long by 24 ft. beam by 5 ft. draft. It is a stern wheel vessel and is propelled by two 200-hp. steam engines. Five barges are used for transporting the sand to the land plant, two with steel hulls and three with wooden hulls. These are deck type barges carrying about 165 tons of sand each.

Only Dredging Operation on This Section of Missouri River

Sand is not very plentiful at this point on the Missouri river, and it is understood that there are no other sand or gravel dredges operating on the Missouri river above St. Joseph. The sand and gravel operations on the Missouri river and its tributaries, espe-

cially the Platte river above St. Joseph, are either pit operations, back some distance from the river, or use other than pumping or dredging methods.

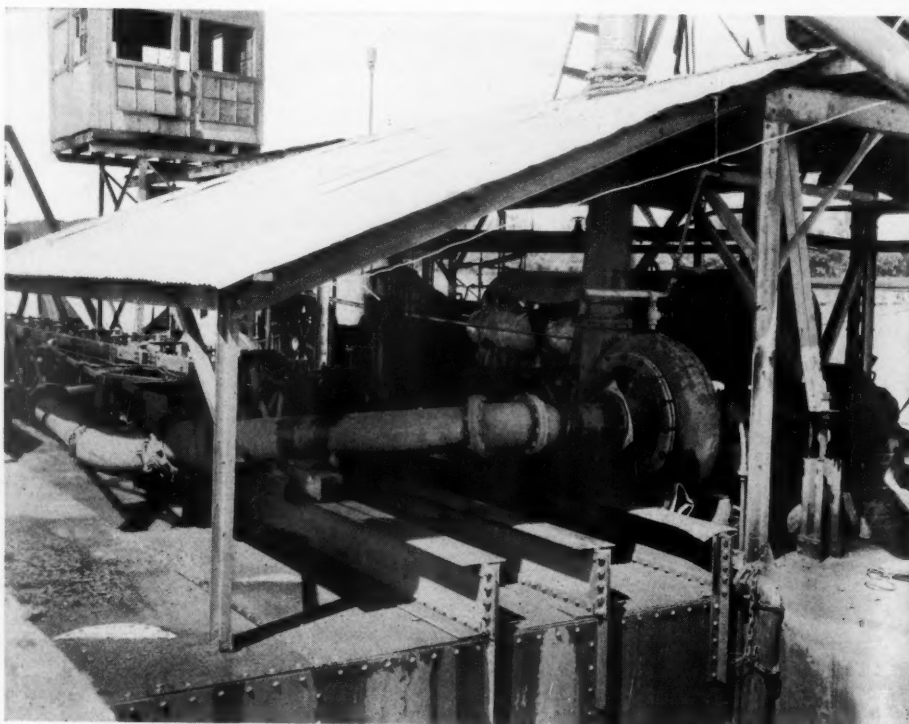
Personnel

The offices and land plant of the Pioneer Sand Co. are at 202 West Francis Street, St. Joseph, Mo. Bernard Feeney is presi-



Capt. Stewart has other interests besides dredging

dent; Capt. R. J. Stewart, vice-president and general manager; C. J. Feeney, secretary, and I. A. Vant, treasurer.



View of dredge, showing arrangement of suction line and pump, with dredge ladder in background



The "Magic City" docking at Philadelphia with her escort of tug boats

"Magic City" Moves to New Home

WARNER CO., Philadelphia, Penn., recently added the *Magic City*, one of the finest dredges on the Atlantic seaboard, to its sand and gravel producing equipment.

The *Magic City* is no stranger to the Warner engineering department, for they designed her in 1926 and had her built at the Wilmington plant of the American Car and Foundry Co. This engineering work was done for the Meteor Transport and Trading Co., Miami, Fla. In the same year the big dredge was towed by two tugs to Miami, where she has been ever since.

Back to the Delaware River

Recently, due to a change in Florida business conditions, the Warner Co. found it possible to secure the services of the *Magic City* on a two-year lease. It was decided to bring her north, to work in the Delaware river territory of the company.

Three Warner boats aided the huge sea-going tug ease the dredge alongside at Berks St. All four towboats are seen in the background of one of the illustrations while the business end of the *Magic City* is shown in the foreground. Another illustration shows an over-all view of the dredge. This photo was taken only a few hours after the dredge arrived at Berks St. and shows three men already removing the temporary planking along the side, put there to keep the high seas from washing into her. Such protection was not necessary to enable the *Magic City* to safely weather the disastrous Florida hurricane through which she passed, and with little damage, as described in *Rock PRODUCTS* Oct. 16, 1926.

No Worse for the Trip

However, the log of the voyage up from Miami as told in a recent issue of the *Warner-American News*, proves that this was not an inadvisable precaution.

Tied up at Berks St. after the long journey, the *Magic City* was little the worse for

the trip. This dredge was described in detail in the December 16, 1926, issue of *Rock PRODUCTS*.

At Berks St. she will undergo some changes to adapt her to her new digging grounds. About the middle of May the dredge took her first mouthful of Pennsylvania earth on the Burton property, one-half mile down the Delaware river from the Manor plant. This property adjoins the Arsenal property where the Manor dredges are now working. The *Magic City* is digging from the riverside, while the others are working in a lake, the level of which is 5 ft. above high water in the river.

Will Improve Operation

This dredging machine will make it possible to shut down the Berks St. yard crusher and do away with the dredge *Philadelphia*, now working in the Delaware. It is the belief of the company that the acquisition of the *Magic City* will greatly improve operating economy in the sand and gravel department.

A crew of 20 men is required to operate the dredge in 24-hr. service. All but one or two of the crew were recruited from the

present personnel of the Warner company.

She is 160 ft. long, 50 ft. wide, with only a 7-ft. draft. The main power plant is a 500-hp. diesel engine, which not only supplies the operating power direct, but also runs the main generator for the electric auxiliaries. A smaller engine is connected with an auxiliary generator, which supplies light and power while the dredge is not working.

Comfortable living quarters are provided for the entire crew. The dredge even boasts its own electric refrigeration system.

The most notable feature about the *Magic City's* equipment is its system of primary and secondary stone crushers.

Kansas Counties to Receive Royalties from River Sand Operations

SHAWNEE, KAN., county funds may be increased by \$15,000 if the county commissioners' plans for obtaining sand royalties are realized.

Under a law passed by the 1931 legislature counties may receive half of the royalties paid for sand taken from the river if a survey is made showing the number of miles the river flows in the county claiming the royalty. Shawnee county is the only county that has complied with the law, but the survey has not been made.

George Knapp, chief engineer for the state board of agriculture, will approve the engineer who is awarded the job of making this survey.—*Topeka (Kan.) Journal*.

Hard Pan Hurts Workman in Gravel Pit

LAWRENCE RACHFORD, Xenia, Ohio, received painful injuries to his right hip and knee while employed at the city gravel pit recently. Mr. Rachford, with several other men, was digging gravel when a piece of hard pan loosened and struck him.

He was removed to his home and later was taken to the office of a physician where an x-ray revealed the extent of his injuries.—*Xenia (Ohio) Gazette*.



Removing temporary planking which protected the dredge on its ocean voyage

Economics of the Nonmetallic Mineral Industries*

Part VI—Marketing Service—An Important Sales Aid

By Raymond B. Ladoo

Manager of the Industrial Commodities Department, United States Gypsum Co.

AFTER A PLANT is built, markets found, and the product is moving out to customers in satisfactory volume the next step is to service the markets.

By servicing we mean (1) following up shipments to new customers to see that everything is satisfactory—quality, price, performance, packing, shipping schedules, etc.; (2) checking of quality and performance with old customers; (3) watching for plant or process changes in customer's mill or product or market which will require a change in his raw material (either adaptation of old material or entirely new material); (4) handling of complaints; (5) instructing customer in best methods of handling or using raw material; (6) watching for competitive materials and observing their performance as compared with that of own materials; (7) developing new uses for own materials and extending old uses; (8) making new market surveys and keeping old ones up to date.

How Servicing is Done

In small "one man" companies servicing, if any is done, is done by the manager or owner or principal operating official. In such companies servicing may be very good if the owner knows his product, is energetic, and takes a personal responsibility for, and interest and pride in, his company and its products. He studies his customers' needs until he knows how to serve them best.

Under the most favorable conditions this is the very best type of servicing. The personal contact between the producer-owner and his trade may become very close and materially helpful to both parties.

But where the owner does not take this personal interest service is often most conspicuous by its absence. The company is not large enough to hire a good man and the ordinary low salaried employe of a small company has neither the ability nor the initiative to do this servicing well.

In medium sized companies, the servicing is often left to salesmen, and may or may not be done well. How well it is done largely depends upon the individual salesman; but it also depends on

Editor's Note

IN THIS PART Mr. Ladoo points out the importance of service in winning new markets and in holding those already established.

Many companies have come to realize, after costly attempts to gain new markets, that it is even more important to keep profitable established business than to win new customers. Study may also serve to increase consumption by old customers. Market service is the means by which this can be accomplished.

The type of product and size of the selling company are factors that determine the type of service necessary and to what extent it is economically justified.

—The Editor.

some extent upon the type and nature of the product, type and kind of industry, dealer or consumer who buys the product, attitude of the management, amount of salesman's time available for servicing apart from straight selling, and so on.

Sometimes a mature salesman who travels the same territory for many years attains almost the producer-owner relationship with his trade and does very valuable servicing work. Often, however, in this type of company, very little efficient servicing is done. The company is too large for close personal producer-consumer contacts and too small to hire special men for this work or to spend enough money on it to get adequate results.

In large companies the need for servicing is usually recognized and more or less adequate provision is made for it. Some companies have special service departments with separate personnel and machinery for handling the work efficiently. Other companies rely upon their chief chemist or plant engineer to handle the more difficult work and expect the salesmen to handle the routine. Still other companies rely entirely upon their salesmen for this work, but pick their men very carefully for their abilities as service men as well as salesmen. They usually employ the engineer or chemist type of man and pay adequate salaries

to get really good men. Where a company's principal products are sold for industrial uses or for uses where technical knowledge is important, this is the best way of handling servicing (as well as actual selling).

Need for Special Service Men

Where a rubber company or paint company or similar industrial plant is having trouble with a product or process it is a great help to them to have available an expert who knows both the raw material and their process. In such a case an ordinary salesman or an inexperienced service man is worse than useless. Some industrial plants get so exasperated with ordinary salesmen who try to handle their complaints that they will not permit them in their plants. In some cases they have even requested producers to keep salesmen away from their plants. They say, "We welcome help from service men who know their products and our problems, but keep your salesmen away."

Servicing Requirements Vary

Markets and products vary considerably in the type and amount of service needed. Such construction materials as sand and gravel, crushed stone, and so on, if properly prepared from a good deposit, probably need a minimum amount of technical or product servicing. At the other extreme are special cements, high grade filler materials (clays, whiting, barytes, etc.), industrial gypsum plasters, chemical limes and so on which are sold to industrial plants for highly specialized uses.

Taken as a group, industrial uses require far more product servicing than structural or building uses, and industrial servicing usually requires much more highly specialized technical knowledge. Developing new industrial uses or expanding old ones requires a great deal of experience, knowledge, ability, tact and perseverance, as well as time and patience. Usually it takes considerable laboratory and production research at the producer's plant, as well as similar research at the consumer's plant.

A good service man must be able to go into an industrial plant and work with the chemist, superintendent, foreman and workmen without antagonizing them. He

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must break down prejudice and change old methods of doing things, so tactfully that he makes friends (and customers) rather than enemies. He must know more about his product, and usually about his customers' processes, than they do, but he must use that knowledge so skillfully that he gets them to work with him, not against him. Obviously, this phase of service work requires a special type of ability and more time than the average salesman can devote to it.

Benefits from Servicing by Salesmen

But ordinary servicing of some products, and this includes certain types of routine complaints, should be done and can best be done by the regular salesmen. A good salesman can often turn a complaint into an order, a dissatisfied customer into a good friend and a booster for his products.

The servicing of ordinary complaints teaches a salesman more about his own products and his customer's needs than he could learn in any other way. He has a chance to get on a close intimate basis with the man on the job, who after all can make or break most materials he works with. He can usually teach his customers something about the handling or use of his materials which will save them time, trouble or expense.

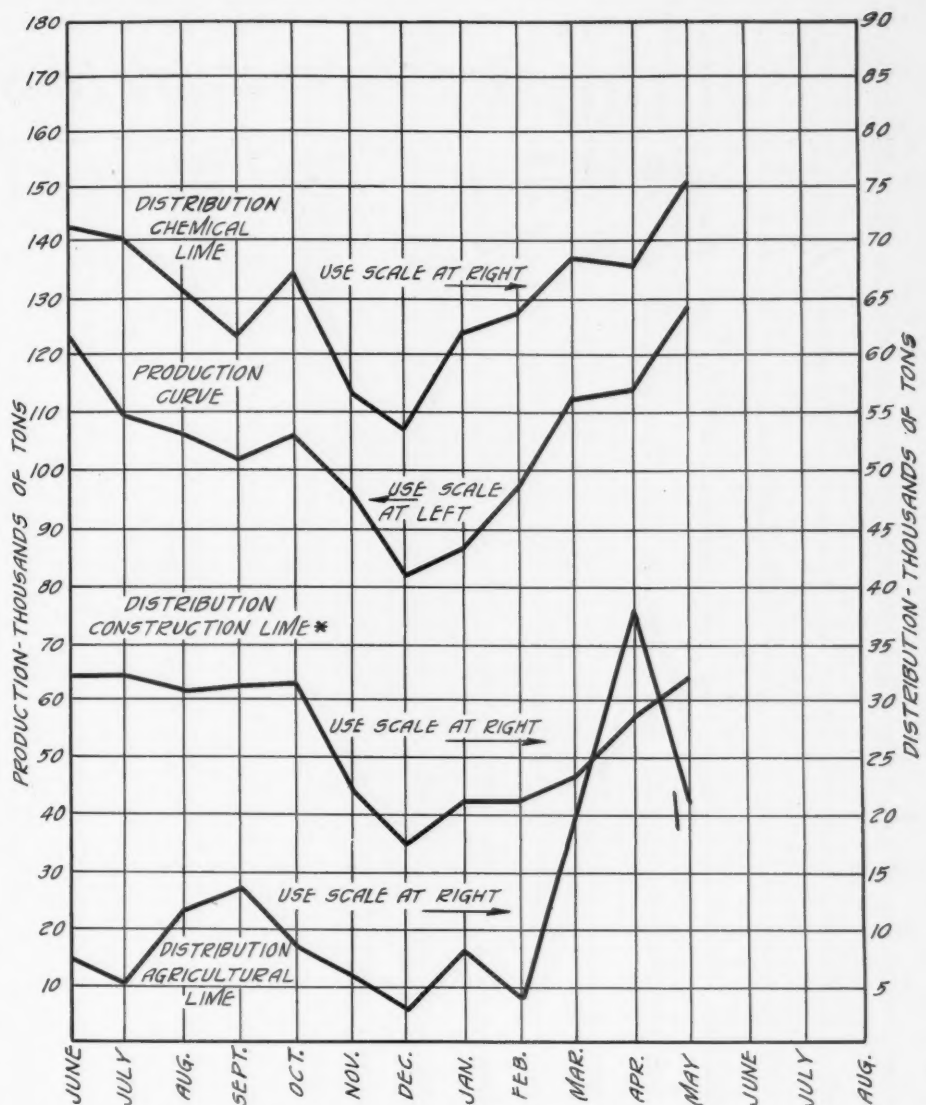
When a salesman settles a complaint to the complete satisfaction of the customer (and his own company) he and his company increase in importance and friendliness in the eyes of the customer. Many experienced salesmen say that the handling of complaints is one of their biggest helps to selling. They want to handle their own complaints and would object strenuously to having an outsider (as they often consider a service man) come into their territory and work with their customers.

Some companies are apt to consider servicing as a needless expense and an unprofitable "frill." But some phases of servicing—for example, complaints on quality of goods which involve damage claims—must be done anyway, and if properly handled may save a company considerable money. Other types of servicing, such as development of new uses and making market surveys, if handled in the right way can be made to pay big dividends. If properly planned and executed by able men, money spent on service work is a paying investment instead of a necessary evil.

(To be continued)

Officer of Keystone Cement

ANNOUNCEMENT is made of the election of Stuart P. Maginnis as secretary and treasurer of the Keystone Portland Cement Co., Philadelphia, Penn., by the board of directors on July 17. He succeeds E. L. Clarke, resigned.



* DOES NOT INCLUDE FINISHING LIME.
CURVES BASED ON 43% OF TOTAL LIME PRODUCTION.

Graphic representation of the lime industry for year ending May 31, 1931

Testing Highway Materials

TWO VOLUMES of value to highway engineers and material producers have just been published by the American Association of State Highway Officials. One volume, "Tentative Standard Specifications for Highway Materials and Methods of Sampling and Testing," contains a comprehensive summary of all specifications in this field that have been adopted by the association. The other volume, "Specifications for Highway Bridges and Incidental Structures," contains in complete form the standards adopted by the association and covers everything pertaining to concrete, steel or timber bridges.

Many methods of sampling and testing materials are published in the highway volume for the first time. Seventy-four methods of sampling and testing materials are presented and, since many of the methods are similar to the standards of the A.S.T.M., reference to the A.S.T.M. standard is given in notes under the titles. Changes from A.S.T.M. standards are in-

dicated by footnotes following descriptions of the methods.

The books may be obtained for a nominal sum from the American Association of State Highway Officials, Washington, D. C.

Lime Industry Statistics

STATISTICS of operations in the lime industry have now been maintained for over a year. The statistics available include the distribution of chemical lime, of construction lime (except finishing lime) and of agricultural lime. Lime production is also given.

While this fundamental information, supplied by the National Lime Association, represents only 43% of the total number of lime producers of the country reasonable accuracy in estimating total production and distribution should be obtained from it by doubling the amounts shown in the accompanying chart. Rock Products will publish this information monthly.

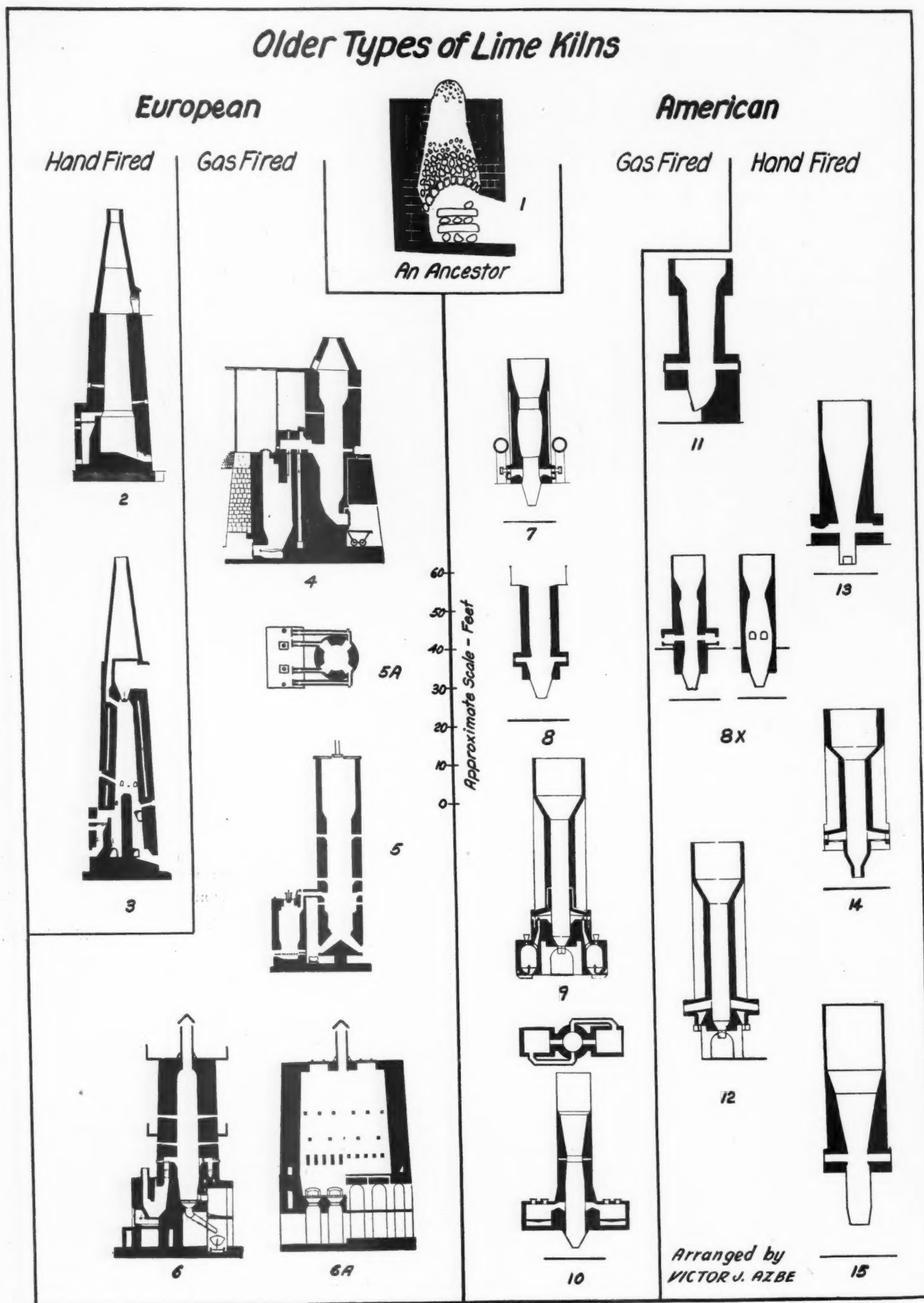


Fig. 70. Older types of American and European lime kilns

Lime Production Methods of Europe and America

Part V—The Early Evolution of Lime Kilns

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

AT ONE TIME man was a tree climbing, chattering monkey, the horse was many toed and the size of a dog. Very gradually, they evolved to what they are today. Occasionally, certain evolving branches would go wrong, degenerate and become extinct—only the better, hardier survived. Not only man and beast, but almost everything else is subject to the laws of evolution, the continual trial and correction of error. The development of the motor car from initial crudeness to the present comparative perfection in almost imperceptible steps is a signal demonstration of industrial evolution.

Figure 70 pictures 15 older type kilns with the aim to show the tendency of improvement. Although many links are missing to form an unbroken chain, still the steps of increasing perfections can be plainly noted. All of the kilns shown either still are or at one time were in operation. European and American kilns are shown separately, and it is peculiar how different the construction characteristics are. It almost appears as if the European lime burner has lived on a different planet without any contacts whatsoever with the American manufacturers.

Only the older types of hand fired and gas fired kilns are shown. The newer types as well as the rotary and the mixed feed kilns are a different story to be taken up at a later time. The ring kiln also is not included, since it is now used only in Europe, although at one time attempts to use it were made in this country. Fig. 71 shows the left-overs of such a ring kiln to be found at the plant of Mr. Carson at Riverton, Va. Mr. Carson said that it was not such a bad kiln but that one could operate it only with Negro labor still used to conditions slaves had to work under and that no present day Negro and particularly no white laborer would be willing to work in them. This kiln is small. In Germany now they use many kilns of the same principle but all several times larger, with the tunnel winding back and forth so as to get the most of



Fig. 71. Remains of ring kiln at Riverton, Va.

Editor's Note

IN THIS PART the author discusses the early evolution of the lime kiln, and auxiliary equipment. Illustrations of several types of kilns are shown, and their important characteristics, both good and bad, but mostly bad, are pointed out.

This story is an introduction to the description of modern European lime kilns, which will appear in a later part. Of interest in this part is the author's visualization of the progress of the American lime industry. We anticipate his picture of possible improvement in production methods of the industry in this country will be of exceeding interest.—The Editor.

it into the least space. Even these modern ring kilns are, however, out of the question for American conditions.

Kiln No. 1 of Fig. 70 is one of the ancestors, intermittent in operation and using wood for fuel. The intermittent kiln, that one had to charge and after charge was burned completely, had to be entirely emptied, was naturally inefficient in labor and fuel and so it practically disappeared. Wood, however, where new land is being cleared and is therefore cheap, is still used, Fig. 72 showing one

such plant at Springfield, Mo. All one can say for wood is that it does give soft burned lime, otherwise, as ordinarily used it makes about the most inefficient fuel of any used for lime burning. The fact that it does give soft burned lime is by itself evidence that, due to its high moisture content, temperature developed is hardly ever high enough to over-burn the lime. A study of lime burning with wood should most thoroughly quench the ardor of those who still rave about the great value of steam in lime kilns.

Kilns No. 2 and 3 of Fig. 70 are earlier types of European hand fired kilns. Only two examples are shown and even they are becoming increasingly scarce.

Kiln No. 2 is of a type used at Rudersdorf near Berlin and is still in operation. As these kilns will soon completely disappear, and as we over here are entirely unfamiliar with European hand fired practice, Fig. 73 and 77 should be of interest. Fig. 73 is a view taken about a year ago showing eleven of the twenty-two kilns of No. 2 type, all having the characteristic chimney for increasing natural draft. Fig. 74 shows the charging platform running between the two lines of kilns. Fig. 75 shows the method pursued in charging one of the kilns while in Fig. 76 the fireman is just replenishing coal in the fire-box.

Some one may say, "Ha, even the Germans find hand-firing useful," but Fig. 77 taken recently shows that even in this plant conversion is taking place and the second kiln in the forefront was changed by Herr Seeger into a mixed feed type with a height higher than the original kiln and chimney combined.

Kiln 3 of Fig. 70 is in many respects similar to kiln 2 but it indicates strenuous thought and effort at improvement of the faults of No. 2. Evidently the older type kiln did not burn the lime well in the center of its shaft, so a solid core was inserted. Attempts were made to reduce loss due to radiation by insulating the kiln. The charging door in the older type



Fig. 72. Intermittent wood-burning kilns

must have been leaking, cooling the chimney and reducing the draft, also when the stone was dumped in much air entered the chimney through the open door so the newer kiln was charged through a bell which could be maintained tight. Nothing shows so beautifully the progress in design as the contrast in these two kilns although both of them are now obsolete.

Worst But Not Earliest

Kiln 11 of Fig. 70 starts the American series of hand fired kilns. It is not one of the earliest but why go any further back since it is difficult to find anything worse. Unfortunately, these kilns, in long rows, are still in operation today. There is nothing that is right about this kiln, the fire-boxes are of poor design, the eyes to the shaft small and such that they frequently slag up, the shaft of such proportion that lime with core is drawn from the center and overburned lime from over the eyes. The cooler is all wrong and so is the storage zone. It is impossible to get uniform travel of limestone downwards or uniform flow of gas upwards. It is impossible to draw right

or to trim right. The kiln has a large internal space but what good is it if the hot gas cannot percolate into it; space is ample to make 20 tons with natural draft but it is actually making only 8 tons per day.

With nothing that can be much worse, the improvement starts, but very erratically and to this day without arriving at something entirely satisfactory. Kiln 13 has a tapering shaft with a very poor furnace and cooler design. To draw in, to get the heat into the center is all right, but it is too much to expect of the gas stream to divide itself uniformly over a continually expanding cross-section, especially as it cools and so shrinks in volume. All that one can say for this kiln is that it is an "attempt."

Kiln 8 is interesting. The fire-box is such that the fireman, if he has skill, may utilize it, which was not so in case of either kiln 11 or 13. The cooler is more roomy and of good shape which is as important a step as any. As to the wobble-waggle of the shaft though, it is impossible for me to become enthused over it. One may theorize and write volumes as to how the stone and gas will flow and

how it will be aided by the twisting design but I just cannot become converted to it. I may be wrong but I like a plain straight shaft of a size consistent with the amount of coal one can burn on the grate.

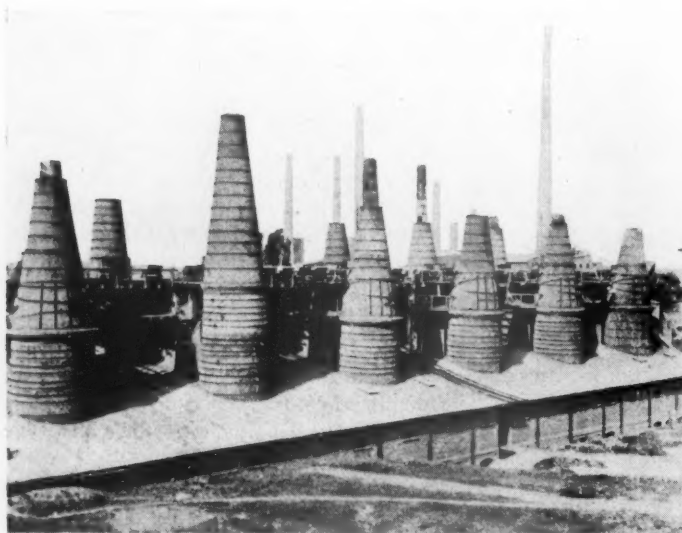
Kiln 14 is a type of which there are hundreds in this country. A good kiln for those who are satisfied with a fuel ratio of $2\frac{1}{2}$ or 3:1 and ten tons of lime per kiln day. Kiln 12 is much better. It has a higher and straight shaft 5 ft. across between the eyes. The furnaces are of very good design although somewhat deep. The cooler, however, is worthless. This kiln, during a week's test when fired with coal of 11,750 B.t.u. as received, performed as follows:

| | |
|--------------------------------|-------------|
| Coal consumed, 7 days..... | 71,800 lb. |
| Lime produced, 7 days..... | 252,480 lb. |
| Average production per day.. | 18.05 tons |
| Output per sq. ft. kiln shaft | area |
| ..... | 772 lb. |
| Tons of lime per ton of coal.. | 3.51 |

If this kiln would have had a cooler as kiln 15, deep and roomy, one could say that it would have been in the highest state of development possible for a hand-fired type. Kiln 15 performs well, due entirely to its cooler, as its furnaces and particularly the type of shaft are far from good, the shaft being too squatty and expanding, and the storage zone overly large. Perfection in the light of knowledge of today lies in combination of the best features of 12 and 15.

Too Much or Too Little Air

No matter how much one improves a hand-fired kiln, however, results will not be the best, as hand firing is irregular firing, conditions in the kiln being right only a fraction of the total time, with the balance fluctuating between excess air or air deficiency. This was realized for a long time and so attempts at the use of gas were made long ago. Naturally, some believed that it was not practical, as they also laughed when some



Figs. 73 and 74. Some old European kilns of No. 1 type



Fig. 75. Charging one of the old type of kilns

progressive producers started to add water to lime and sell it as hydrate.

The first kilns fired with gas had individual producers located so closely as to be almost integral with the kiln. The German kiln, No. 4 in Fig. 70, is such an installation, the deep producer, the deep lime cooler, and the attempt at preheating primary air, all indicating ingenuity. The deep producer means that gas entered the kiln under pressure; the deep cooler that secondary air was thoroughly preheated and heat that otherwise would have been wasted by drawing hot lime reverted into the kiln. This installation, for being an early installation, certainly is a credit to the designer in spite of the fact that actual results may not have been so good. Very good results can, however, not be expected from such a small kiln and neither can they from a small producer. The reason for the producer is regularity. If gasification per square foot of producer area is too high, the top of the fuel bed is too hot, causing rapid evolution of volatile matter immediately after firing and consequent reversion towards direct firing. If uniform conditions are desired, the producer must be either automatic, which type came much later, or the producer must be so large that the top of the bed is always comparatively cool and so the evolution of gas as well as its quality is constant.

Kiln No. 5 with cross-section at 5-A was larger. Gas was supplied to four eyes through independent ducts. The fact that the walls are drawn back where the gas enters, making the kiln diameter larger, is interesting. It facilitates entrance of

gas but may have been rather hard on the protruding portion with heat affecting it both on the lower as well as inner portions.

Kiln No. 5 had a round shaft very unusual in our part of the world; fully as unusual is, however, kiln No. 6 which has a shaft about 6x22 ft., fired through 20 narrow eyes. This is the so-called "Lochner" kiln and at Friedenshuetten, Upper Silesia, as shown in Fig. 78, there is a large installation of eight of these kilns. Berthold Block in his admirable German book on lime burning states that the concern having these eight "Lochner" kilns has also one large ring kiln with the following performance comparison:

OUTPUTS OF TWO TYPES OF GERMAN LIME KILNS

| | One large ring kiln | Eight "Lochner" gas kilns |
|----------------------------------|---------------------|---------------------------|
| Space occupied, sq. ft..... | 17,200 | 8,100 |
| Lime produced per day, tons* | 137 | 200 |
| Fuel ratio | 4-1 | 5½-1 |
| Labor cost per ton* (1917) | 87c | 12c |

*Tons of 2240 lb.

Now whether this is all so, or as untrue as most other lime plant figures, I don't know, but certainly even after making all possible allowances the difference is startling. This good showing does not, however, save the Lochner kiln from our classing it as an older type of gas kiln, not worthy of emulation in the modern sense.

A Study of Antiques

As in this issue we are concerned only with the more antiquated equipment, we must, for the present, forego examination of more modern types of European gas kilns and return to the study of American gas kiln types.



Fig. 76. Hand firing

I fear that the reader will soon get tired of my casting stones at our lime kiln progress, or better stated, lack of progress. But then, how can you have progress without continual trial. And in comparison with Europe, there was little trial over here, much less fluidity of mind and much greater tendency towards standardization upon such an outrage as kiln 14. In Europe the number of different types of kilns evolved at different times is very, very great. They appeared never to have been satisfied. One could gather up a whole museum collection, some so amusing as to more properly belong in a side show of a circus—shafts of the zig-zag type, air cooled shells without lining, water jacketed shafts, etc.

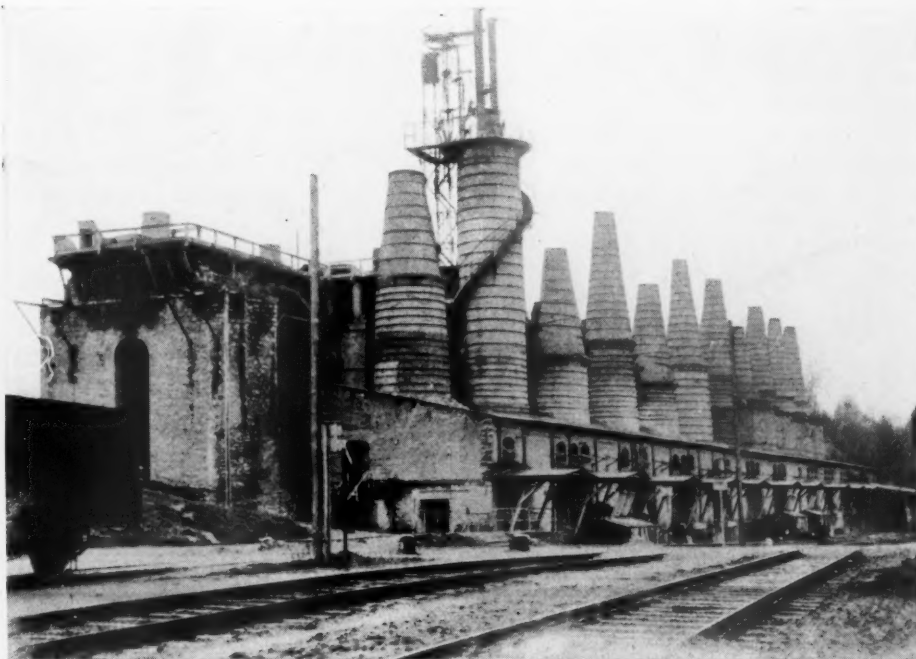


Fig. 77. Modernizing some of the old German kilns

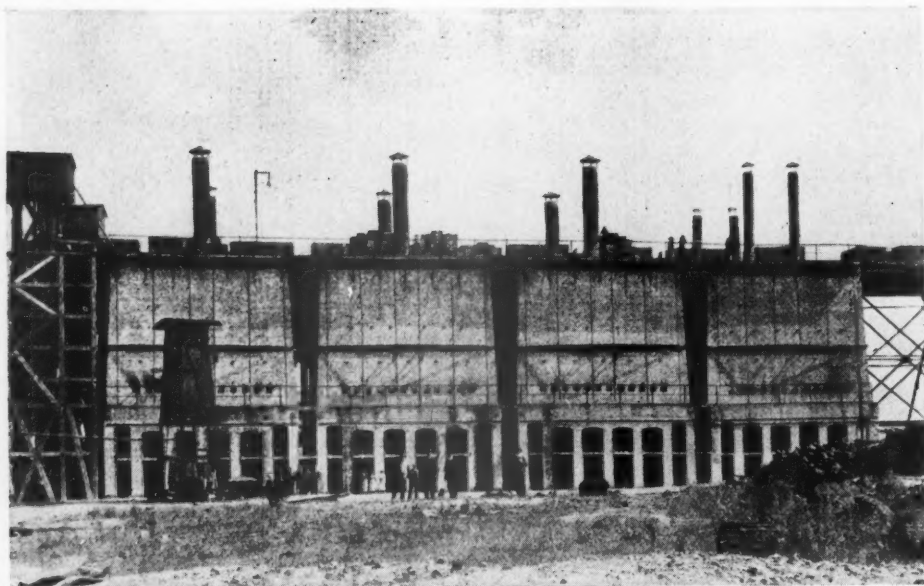


Fig. 78. Lochner kilns at Friedenshuetten in Upper Silesia

Mistakes were made by the score but all contributing to the evolution of something better and indicating a dissatisfied restlessness and continual hankering for the ideal.

Two Elements—Kiln and Gas Producer

The development of the kiln is one thing, the development of the producer another and with one right and the other wrong combined, we have one poor plant. In the case of kiln 7 the producer supplied very good gas, but the kilns were too small, inconveniently placed with too shallow coolers and other objections. The installation at its best, however, was better than hand-fired kilns which is just about all one can say for it.

Kiln 8 is again a small, inefficiently designed kiln which, however, is supplied with gas that continually varies in temperature, volume and analysis, so again, while somewhat better than hand firing, the installation is hardly worthy of being called a gas-fired plant.

Some of the worst results I ever obtained on a lime kiln were obtained on kiln 9. The producers were small and

the fuel bed so hot (2000 deg. F.) that when coal was fired every half or three-quarters of an hour smoke was as dense as one ever sees evolving from a hand-fired kiln. The cooler was shallow and all the air for combustion entered past the burner. When the coal was fired on to the hot bed such a large volume of gas was evolved that it prevented air access and as a result kiln waste gas analysis contained as much as 12% carbon monoxide with fuel ratios much worse than obtained in hand-fired practice. Fig. 79 shows the plant in operation under these conditions, and following are given waste kiln gas analyses for a period of one hour:

| Time | Per cent. | | | Smoke |
|-------|-----------------|--------|-----------------|--------|
| | CO ₂ | Oxygen | Carbon monoxide | |
| 10:25 | 29.4 | 0 | 12 | Heavy |
| 10:42 | 28.4 | 1 | 1.2 | Light |
| 10:47 | 24.0 | 0 | 0 | None |
| 11:00 | 24.2 | 4.5 | 0 | None |
| 11:15 | 32 | 0 | 12 | Heavy |
| 11:30 | 28.7 | 0 | 2.4 | Medium |

Fuel ratios were about $2\frac{1}{2}$ to 1, or just about half of the previously mentioned Lochner kiln. Fortunately, however, these conditions do not now exist

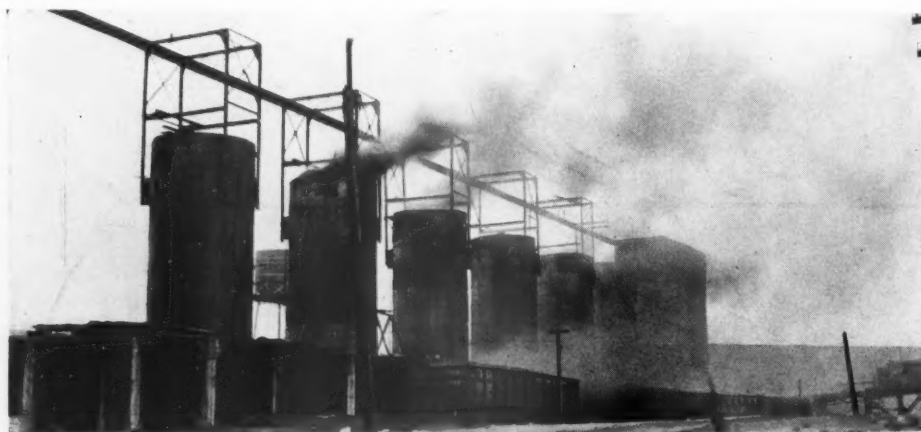


Fig. 79. Inefficient operation of type 9 kilns

and have not existed for several years. The kilns are still in use but the producer system was entirely reorganized.

Kiln 10 has an interesting history, being a degenerate, copied improperly from a fairly good kiln. Schmatola once built a plant that performed well. It was nicely balanced and had a deep cooler and deeply located, large gas producers. Wanting to save money, a lime manufacturer engaged the bricklayer who laid the brick for Schmatola. The bricklayer assumed himself as an expert so instead of making an exact copy injected here and there some of his "improvements" but when the kilns—four of them—were put in service they refused to act improved, in fact, they insisted to be quite the contrary. Capacity was only six tons per day per kiln, the lowest I ever encountered. Whenever the producers were fired the gas entering the kiln would squeeze out the air and we know that gas without air does not burn, also that gas without air is a very dirty substance, so the plant per ton of output proved very expensive, capacity was very low, fuel costs very high and lime very poor.

(To be continued)

Organize Idaho Company to Develop Phosphate Deposits

GEORGE R. PARKS, field representative of the Mineral Products Co., which proposes to take over the property of the Idaho American Fertilizer Co., in Parma, Ida., was in Parma recently and stated that the former company had filed incorporation papers with the secretary of the state, with Norman B. Adkinson, Thomas J. Davis and George R. Parks of Boise as incorporators. The company is incorporated for \$250,000 and stock to this amount will be offered for sale at \$1 per share.

Mr. Parks states that the company has already contracted for the purchase of a large phosphate mine on the Idaho-Wyoming line which will furnish all the material necessary for years.—*Parma (Ida.) Review*.

Announce A. R. B. A. Convention Program

A RECENT BULLETIN issued by the American Road Builders Association outlines the program planned for the 29th annual convention to be held in Detroit, Mich., January 9 to 15, 1932.

Subjects to be considered are recent changes in methods of state highway financing; methods of highway location; design and construction of roads, streets and surfaces; construction and maintenance methods for low cost roads, streets and bridges; county planning; construction equipment; grade crossing improvement; traffic and motor freight. A detailed program will be issued later by the association.

The Selection of Durable Aggregate for Concrete *

By M. Temin, W. Pigman and J. Tucker, Jr.

ALTHOUGH the destruction of the cementitious binding material is the usual form of failure in concrete that disintegrates, aggregates have been the cause of disintegration of otherwise sound concrete. McMillan and Ward† have summarized the recorded instances of the latter type of disintegration and listed the mineral structure and constituents of the aggregate responsible for the failure. In the selection of aggregates for use in concrete that will be weather durable, those that will cause disintegration must therefore be eliminated.

Although laboratory tests simulating weathering have been developed and applied to a large variety of materials, yet the methods do not appear wholly adequate nor have the wide range of materials commonly used for concrete aggregate been more than cursorily investigated.

The present series of tests were therefore made to study aggregate materials whose durability had not been tested and to compare accelerated tests.

The sodium sulfate treatment has been used extensively for over a century‡ as a test for weather resistance of materials. The use of a salt that assumes three crystalline forms within the normal range of temperatures is attended with many uncertainties but because of its wide use, the test was included in the present series. The sodium chloride test, which has been used to some extent, was also included as well as a new test consisting of alternately boiling and drying the specimen. The use of salts is appropriate since some weathering of building granites has been definitely assigned by D. W. Kessler of the Bureau of Standards§ to salt action and positively not to freezing.

Although disintegration of materials exposed to weather action may result from a number of causes other than freezing and thawing, it has been universally assumed that the great part of the disintegration has been caused by the freezing of entrained water. Freezing and thawing tests have therefore been used in this investigation as the standard to indicate weather resistance. It has further been assumed that if the aggregate withstood direct exposure to weather

| Outline | |
|---------|--|
| I. | Introduction |
| II. | Tests. |
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| | (D) Treatment of sample after durability tests. |
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| | (A) General. |
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| | (1) Absorption and porosities. |
| | (2) Kreüger and Schurecht criteria. |
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it would withstand weathering at least equally well when incorporated in concrete.

II. Test Procedure

(A) Test Material

It was desired that the test material should represent the types of coarse aggregates most commonly used for concrete. Specimens of granite, limestones, sandstone, trap, gravels of miscellaneous types, and several blast furnace slags were therefore included in the tests. Unfortunately none of the kinds of aggregate known to have caused failure was secured.

The number of types and locations having been decided upon, the state highway officials of the following states assisted in securing well graded lots of each material:

1. Connecticut.
2. Illinois.
3. Kentucky.
4. Minnesota.
5. New Hampshire.
6. New Jersey.
7. New York.
8. North Carolina.
9. Ohio.
10. Pennsylvania.
11. West Virginia.
12. Wisconsin.

The slags were secured through the courtesy and cooperation of the secretary-treasurer of the National Slag Association. The cooperation of the highway officials is also gratefully acknowledged.

Table I gives a list of the specimens re-

ceived, together with general information on the material.

(B) Treatment Before Tests

The 36 lots of coarse aggregate, each weighing about 500 lb., were screened as received. The material retained on the 1-in. screen was rejected, together with that passing a No. 4 sieve. Each lot was then thoroughly mixed and the material halved, one half being stored for reference, while the other half was divided into six parts, which will be called samples, each sample weighing approximately 40 lb. A granular analysis was made upon five of these samples, using the No. 4, 3/8-in., 1/2-in., and 3/4-in. screens.

One sample was made up into concrete cubes. Four other samples were treated as described in the next section, after which a granular analysis was again made and the material then incorporated as coarse aggregate in concrete cubes. The material of the remaining sample was tested for absorption, specific gravity, etc.

(C) Durability Tests

The material used in the four durability treatments was kept in special metal baskets for convenience in handling. The baskets were made of galvanized sheet iron, 12 in. wide, 24 in. long and 3 1/2 in. deep, with bottoms of 1/8-in. mesh galvanized wire screening to facilitate draining. One sample of each lot was subjected to 150 cycles of one of the following treatments:

1. *Boiling Treatment.* A cycle of the boiling test consisted of 7 hours boiling in water and 17 hours drying in a gas-heated oven maintained at approximately 120 deg. C. This cycle was then repeated, the samples being transferred directly from oven to boiling water without being cooled.

2. *Sodium Sulfate Treatment.* The samples were immersed in a 14% solution of sodium sulfate (sp. gr. 1.13 at 20 deg. C.), maintained at approximately 20 deg. C. The specimens were kept in the solution about 16 hours and then dried in the oven at approximately 120 deg. C. for 7 hours. The cycle was then repeated, the specimens being transferred directly from oven to solution without cooling.

3. *Sodium Chloride Treatment.* A 15% solution of sodium chloride (sp. gr. 1.11) was used. The routine procedure of the test was identical with that of the sodium sulfate treatment.

*Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

†McMillan and Ward, Proc. A. S. T. M., Vol. 29, p. II, p. 816, 1929.

‡Brard: Annales de Chemie et de Physique, Vol. 38, p. 160, 1828.

§Unpublished data.

4. *Freezing Treatment.* The trays containing the samples subjected to this treatment were immersed in water for 48 hours. They were then removed, and stacked, with 1-in. wood spacers, in sheet metal compartments surrounded by a brine bath maintained at approximately 10 deg. F. The specimens were kept in the compartments for 24 hours, then thawed in water at room temperature (approximately 20 deg. C.) for the next 24 hours and the cycles repeated.

(D) Treatment of Materials After Durability Tests

The samples after 150 cycles of the sodium sulfate, sodium chloride, and boiling treatments were covered with a coating of iron rust, the action of the treatments having removed sufficient galvanizing from the baskets to expose the steel and permit its rusting. For the purpose of removing as much of the contained salts and the coating of rust as possible, the samples were soaked in slowly running water. When the water showed no more than a trace of the salts the samples were dried at approximately 120 deg. C. and a granular analysis made.

The samples were then used as large aggregates without regrading (even when broken down to sand size) in a batch of concrete which was sufficient to make four

6-in. cubes in the case of samples that had lost no material by disintegration. The concrete was all proportioned 1:2.5:3.5 by weight, using Potomac River sand as the fine aggregate, and a uniformly mixed portland cement which complied with Federal Specification 1a.

The samples of aggregate which had been subjected to the 150 boiling cycles were the first to be incorporated into concrete and an attempt was made to add enough water to each batch to obtain concrete with a flow of 60 determined on the flow table* after fifteen 1/8-in. drops. Since the grading and surface characteristics of each sample were unlike any of the others and only one batch was made from each sample, the flows obtained differed materially from the desired value of 60. The same water-cement ratio was used for the concrete made with each sample of the same lot of aggregate irrespective of the treatment.

The concrete was shovel-mixed by two laborers, and rodded into the cube molds. The molds and the contents were allowed to remain undisturbed for the next 20 to 24 hours and then the cubes were removed from the molds. They were then stored in

moist air at approximately 21 deg. C. until they were tested in compression.

At the age of three months two cubes of each batch of concrete were tested for compressive strength. When the two results did not check within approximately 10%, a third cube was broken. Those not broken at three months were kept an additional year in moist storage and tested at 15 months.

(E) Petrographic Analysis

The materials as received were all examined with the petrographic microscope to determine the character of the rock, the mineral composition and the structure. Untreated specimens of those lots that showed marked signs of disintegration in the durability tests were examined more thoroughly for mineral composition and structure. The petrographer attempted to correlate the test results with the estimated resistance based upon the structure, microscopically determined, and upon the mineral composition. No correlation, however, could be determined, other than that clay appeared to be a cause of unsoundness, chiefly in limestone.

(F) Absorption and Porosity Measurements

The absorption and porosity values in Table I were obtained from representative

*"Inundation Methods of Measurement of Sand in Making Concrete," by Smith and Slater; Proc. Am. Conc. Inst., Vol. XIX, p. 222 (1923).

TABLE I—TEST MATERIALS AND THEIR PROPERTIES

| Sample No. | Type of material | Location of deposit by state | Specific gravities | | Porosity by volume % | Water by wt. of dry sample to fill all pores | | | Absorption of water at room temperature by weight | | | 6 hr. boiling after 24-hr. absorp. % | Per cent. loss in wt. after 3 absorptions and dryings | Kreuger ratio | Schu-recht ratio |
|------------|----------------------------|------------------------------|---------------------------|------------|----------------------|--|------------------|------------------|---|-----|-------|--------------------------------------|---|---------------|------------------|
| | | | obtained by sp. gr. flask | "Apparent" | | At end of 24 hr. | At end of 3 days | At end of 7 days | | | | | | | |
| 1 | Granite | N. C. | 2.668 | 2.617 | 1.9 | 0.7 | 0.4 | 0.5 | 0.7 | 0.5 | 0.20 | .69 | .80 | | |
| 2 | Granite and gneiss | N. C. | 2.649 | 2.622 | 1.0 | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 | 0.05 | 1.05 | 1.33 | | |
| 3 | Granite (quartz monzonite) | Vt. | 2.679 | 2.645 | 1.3 | 0.5 | 0.5 | 0.5 | 0.8 | 0.4 | 0.25 | 1.00 | 1.25 | | |
| 4 | Trap | N. J. | 2.974 | 2.880 | 3.2 | 1.1 | 0.9 | 1.0 | 1.2 | 1.0 | 0.25 | .90 | .90 | | |
| 5 | Trap | Minn. | 2.851 | 2.773 | 2.7 | 1.0 | 1.0 | 0.9 | 1.1 | 0.9 | 0.20 | .92 | 1.11 | | |
| 6 | Trap | Conn. | 3.000 | 2.922 | 2.6 | 0.9 | 0.7 | 0.9 | 1.0 | 0.9 | 0.50 | 1.01 | .78 | | |
| 7 | Trap | N. Y. | 2.970 | 2.908 | 2.1 | 0.7 | 0.7 | 0.5 | 0.7 | 0.6 | 0.00 | .69 | 1.17 | | |
| 8 | Sandstone | Ky. | 2.681 | 2.508 | 6.5 | 2.4 | 2.3 | 2.4 | 2.5 | 2.4 | 0.45 | .93 | .96 | | |
| 9 | Sandstone | Ky. | 2.667 | 2.408 | 9.7 | 3.7 | 3.2 | 3.7 | 3.7 | 4.1 | 1.80 | .92 | .78 | | |
| 10 | Sandstone | W. Va. | 2.652 | 2.583 | 2.6 | 1.0 | 0.7 | 0.7 | 0.8 | 0.8 | 0.30 | .69 | .88 | | |
| 11 | Sandstone | Vt. | 2.691 | 2.642 | 1.8 | 0.7 | 0.6 | 0.6 | 0.8 | 0.7 | 0.35 | .88 | .86 | | |
| 12 | Limestone | Penn. | 2.745 | 2.675 | 2.6 | 0.9 | 0.8 | 0.6 | 0.6 | 0.6 | 0.40 | .62 | 1.33 | | |
| 13 | Limestone | Ohio | 2.823 | 2.603 | 7.8 | 2.8 | 2.8 | 2.7 | 2.8 | 3.0 | 0.55 | .90 | .93 | | |
| 14 | Limestone | Minn. | 2.757 | 2.592 | 6.0 | 2.2 | 2.3 | 2.1 | 2.4 | 2.5 | 0.45 | .91 | .92 | | |
| 15 | Limestone | W. Va. | 2.753 | 2.711 | 1.5 | 0.6 | 0.1 | 0.1 | 0.1 | 0.2 | 0.10 | .18 | .50 | | |
| 16 | Limestone | N. Y. | 2.847 | 2.808 | 1.4 | 0.5 | 0.3 | 0.3 | 0.4 | 0.3 | 0.25 | .60 | 1.00 | | |
| 17 | Limestone | Ill. | 2.859 | 2.614 | 8.6 | 3.0 | 2.4 | 2.3 | 2.6 | 2.7 | 0.15 | .70 | .89 | | |
| 18 | Limestone | Wis. | 2.853 | 2.766 | 3.1 | 1.1 | 0.8 | 0.9 | 1.1 | 0.8 | 0.25 | .80 | 1.00 | | |
| 19 | Gravel (granite) | N. H. | 2.762 | 2.671 | 3.3 | 1.2 | 0.9 | 1.0 | 1.0 | 1.1 | ..... | .81 | .82 | | |
| 20 | Gravel (mixt-granite) | Penn. | 2.694 | 2.565 | 4.8 | 1.8 | 1.4 | 1.4 | 1.5 | 1.7 | 0.10 | .75 | .82 | | |
| 21 | Gravel (mixt-quartz) | D. C. | 2.706 | 2.554 | 5.6 | 2.1 | 1.2 | 1.5 | 1.5 | 1.5 | ..... | .68 | .80 | | |
| 22 | Gravel-quartz | N. J. | 2.661 | 2.587 | 2.8 | 1.0 | 0.8 | 0.9 | 0.9 | 0.8 | 0.25 | .83 | 1.00 | | |
| 23 | Gravel-quartz | N. J. | 2.709 | 2.532 | 6.5 | 2.4 | 1.5 | 1.7 | 1.7 | 2.0 | 0.25 | .66 | .75 | | |
| 24 | Gravel-quartz | N. C. | 2.666 | 2.616 | 1.9 | 0.7 | 0.5 | 0.5 | 0.5 | 0.5 | 0.15 | .69 | 1.00 | | |
| 25 | Gravel-quartz | N. Y. | 2.685 | 2.620 | 2.4 | 0.9 | 0.4 | 0.6 | 0.6 | 0.5 | 0.15 | .67 | .80 | | |
| 26 | Gravel-sandstone | Ohio | 2.763 | 2.518 | 8.9 | 3.2 | 2.5 | 2.8 | 3.1 | 2.9 | 0.30 | .88 | .86 | | |
| 27 | Gravel-limestone | Ohio | 2.804 | 2.610 | 6.9 | 2.5 | 2.0 | 2.3 | 2.4 | 2.5 | 0.10 | .94 | .80 | | |
| 28 | Gravel-limestone | Ill. | 2.856 | 2.636 | 7.7 | 2.7 | 2.1 | 2.1 | 2.3 | 2.4 | 0.15 | .78 | .87 | | |
| 29 | Gravel-schist | N. H. | 2.738 | 2.642 | 3.5 | 1.3 | 1.2 | 1.3 | 1.4 | 1.2 | 0.65 | 1.02 | 1.00 | | |
| 30 | Gravel-mixt | Wis. | 2.766 | 2.632 | 4.8 | 1.8 | 1.6 | 1.6 | 1.7 | 1.7 | 0.20 | .92 | .94 | | |
| 31 | Blast furnace slag | Ill. | 2.961 | 2.621 | 11.5 | 3.9 | 1.6 | 1.4 | 1.6 | 1.9 | 0.40 | .36 | .84 | | |
| 32 | Blast furnace slag | Ohio | 2.957 | 2.401 | 18.8 | 6.4 | 1.5 | 2.4 | 2.5 | 3.2 | 0.20 | .60 | .47 | | |
| 33 | Blast furnace slag | Ala. | 2.979 | 2.394 | 21.6 | 7.3 | 2.3 | 2.4 | 2.6 | 3.0 | 0.15 | .33 | .77 | | |
| 34 | Blast furnace slag | Penn. | 2.935 | 2.305 | 21.4 | 7.3 | 4.1 | 4.5 | 4.8 | 5.7 | 0.85 | .52 | .72 | | |
| 35 | Blast furnace slag | Ohio | 2.969 | 2.201 | 25.8 | 8.7 | 4.9 | 5.3 | 5.8 | 7.7 | 0.35 | .61 | .64 | | |
| 36 | Blast furnace slag | N. Y. | 2.949 | 2.119 | 28.1 | 9.5 | 4.4 | 5.2 | 6.1 | 8.1 | 0.30 | .55 | .54 | | |

Precision measure of the several quantities in the table, given in terms of standard deviation of the mean; that is, of the value given in the table.

.006 .006 0.3 0.1 0.1 Estimated as to .08 to 1.00

samples weighing approximately one kilogram. The samples were dried to constant weight at a temperature of 105-110 deg. C., and when cool immersed in water at approximately 20 deg. C. The increase in weight of the specimens was determined at the end of 1, 3 and 7 days after immersion. This was done by removing the samples from the water, allowing them to drain for 30 seconds, then drying with a towel and immediately weighing. After weighing, the samples were again immersed. At least two different representative samples from the same lot were used, and where the results did not check sufficiently close more determinations were made on other samples. The absorption was also measured on samples boiled six hours after having been in cold water for 24 hours. After six hours boiling, cold water was slowly run into the boiler until the water was at room temperature. The sample was then taken out, towel dried and weighed.

The "apparent" specific gravity was determined by means of the equation:

$$\text{Sp. Gr. (apparent)} = \frac{W_a}{W_w - W_i}$$

Where:

W_a = dry weight.

W_w = weight in air after seven days' absorption.

W_i = weight in water after seven days' absorption.

The true specific gravity was obtained by grinding the material to a fine state and measuring the displacement of a definite weight of the material. For the determination a sample of about one kilogram was first rough crushed. One quarter of this was then ground until all passed a No. 200 sieve, and 55 grams of the material (weighed to within 1/10%) was poured into a calibrated Le Chatelier flask containing 95% ethyl alcohol. The flasks were kept in a water bath maintained at 20 deg. C. ± 0.1 deg. C. The displacement was measured in millimeters. The "true" specific gravity is then:

$$\text{Sp. gr. ("true")} = \frac{\text{Wt. of material, in grams}}{\text{Vol. of liquid displaced, in ml.}}$$

The porosity was determined after the 24 hours' absorption according to the equation:

$$\text{Sp. Gr. ("true")} - \text{Sp. Gr. (Apparent)} \times \frac{100}{\text{Sp. Gr. ("true")}}$$

To facilitate a comparison of the extent to which the absorbed water filled the interstices of the material, the theoretical amount of water, in per cent., needed to completely fill the voids, was calculated and is given in Table I.

It was noticed that after soaking for 24 hours, drying, re-soaking and repeating the cycle, most materials lost weight due no doubt to the removal of some of the softened surface in drying (as in the limestones and sandstones) and also to the loss of soluble material. The loss in weight in per cent.

for three repetitions of the cycle is given in Table I.

III. Analysis of Data (A) General

The aggregates as received were not uniformly graded. There appeared to be no advantage in regrading all materials and discarding portions of the several sizes so that the fineness modulus of all samples would be the same. Such a process might have changed the relative proportions of the several minerals composing the gravels.

To facilitate a comparison of the amount of disintegration that occurred a "disintegration number," D , was selected, defined by the equation:

$$D = 100 \left\{ 1 - \left(\frac{\text{final fineness modulus}}{\text{initial fineness modulus}} \right) \right\}$$

This number is indicative of the resistance of the specimens to attack. A disintegration number of zero represents no disintegration. The larger the number the proportionately greater is the disintegration. As this number is apparently not reproducible within one or two units, differences of two units are not to be considered as significant. The fineness modulus used is the sum of the percentages of the material retained respectively on the $\frac{3}{4}$ -in., $\frac{1}{2}$ -in., $\frac{3}{8}$ -in., No. 4 and No. 8 sieves.

(B) Concrete Test Specimens

A number of factors other than the soundness of the aggregate influenced the strength of the concrete specimens. An important one was the change in grading, caused by the breaking down of the aggregates in the treatment. This change would give a better or poorer grading, resulting in a concrete having a higher or a lower strength than that made from the untreated aggregate. Another factor was the incomplete removal of the salt solutions from some of the aggregates. This was indicated by the fact that the concrete of the cubes made up with a number of the limestones as aggregate remained soft for several days after making. The mix was not sufficiently rich to permit the strength of the aggregate to appreciably influence the strength of specimens and any incipient weakening of the aggregate could not therefore be detected.

From a study of the data it was concluded that the strengths of the concrete specimens gave no information of value, other than that no unsoundness of the cubes was noted.

(C) Durability Test Results Relation of Various Disintegration Tests

Table II summarizes the disintegration numbers of all samples after treatment. The negative disintegration numbers appearing in the table are due to slight spillages and inaccuracies in measuring the grading.

GRANITES—Of the three granites only one showed appreciable signs of disintegra-

TABLE II—SUMMARY OF DISINTEGRATION NUMBERS

| Material | No. | Disintegration numbers produced by | | | |
|-----------|-----|------------------------------------|---------|-----------------|----------------|
| | | Freezing | Boiling | Sodium chloride | Sodium sulfate |
| Granite | 1 | -2 | 0 | -2 | -1 |
| | 2 | -1 | -2 | 3 | 0 |
| | 3 | 1 | -1 | 21 | 1 |
| Trap | 4 | 0 | 4 | 3 | 3 |
| | 5 | 0 | 3 | 1 | 2 |
| | 6 | 0 | 2 | 0 | 6 |
| | 7 | 0 | 4 | 0 | 0 |
| Sandstone | 8 | 4 | -1 | 6 | 1 |
| | 9 | 73 | 5 | 50 | 66 |
| | 10 | 3 | 2 | 11 | 4 |
| | 11 | 2 | 2 | 2 | 2 |
| Limestone | 12 | 8 | 11 | 10 | 8 |
| | 13 | 10 | 21 | 29 | 19 |
| | 14 | 8 | 17 | 19 | 19 |
| | 15 | 2 | 0 | 4 | 21 |
| | 16 | 0 | 2 | 0 | 2 |
| | 17 | 2 | -1 | 5 | 2 |
| | 18 | 0 | 0 | 8 | 1 |
| | | | | | |
| Gravel— | | | | | |
| Granite | 19 | -1 | 0 | 14 | 8 |
| | 20 | 1 | 2 | 0 | 2 |
| Quartz | 21 | 2 | 0 | 15 | 4 |
| | 22 | 2 | 3 | 0 | 1 |
| | 23 | 3 | 0 | 19 | 7 |
| | 24 | 1 | 0 | 0 | 0 |
| | 25 | 3 | 4 | -2 | 1 |
| Sandstone | 26 | 6 | 1 | 7 | 8 |
| Limestone | 27 | 3 | 0 | 6 | 2 |
| | 28 | 3 | -1 | 18 | 4 |
| Schist | 29 | 5 | 1 | 14 | 5 |
| Mixed | 30 | 3 | 1 | 1 | 4 |
| Slag | 31 | 7 | 3 | 5 | 7 |
| | 32 | 6 | 4 | 1 | 13 |
| | 33 | 11 | 2 | 9 | 11 |
| | 34 | 14 | 4 | 11 | 13 |
| | 35 | 5 | 6 | 7 | 11 |
| | 36 | 6 | 4 | 9 | 10 |
| | | | | | |

tion and that only in one treatment. No. 3 gave a disintegration number of 21 after the sodium chloride treatment. The highest disintegration number of the other samples was 3, the material being practically unaffected. Granite No. 3 was carefully examined petrographically, and no cause for the disintegration could be found. In view of this, a small portion of the untreated material was subjected to the sodium chloride treatment with similar results. An inquiry developed that no disintegration of this material had been noted in field use. The petrographic examination disclosed a small amount of clay in granite No. 3 but none in the other granites.

TRAP ROCK—The trap rock was not affected by the freezing tests; the sodium chloride treatment in every case gave the closest check with the freezing test results. The three other treatments were somewhat more severe than the freezing tests.

SANDSTONES—Although a large percentage of rock No. 8 consisted of biotite mica, chlorite and silica, and was weak, there was very little disintegration. The mica in No. 9 had been considerably altered to chlorite, clay and hydrated ferric oxide, and this rock underwent severe disintegration. The boiling test, giving the low disintegration number of 5, is of no value for this type of stone, since the freezing test gave a disintegration number of 73 and the

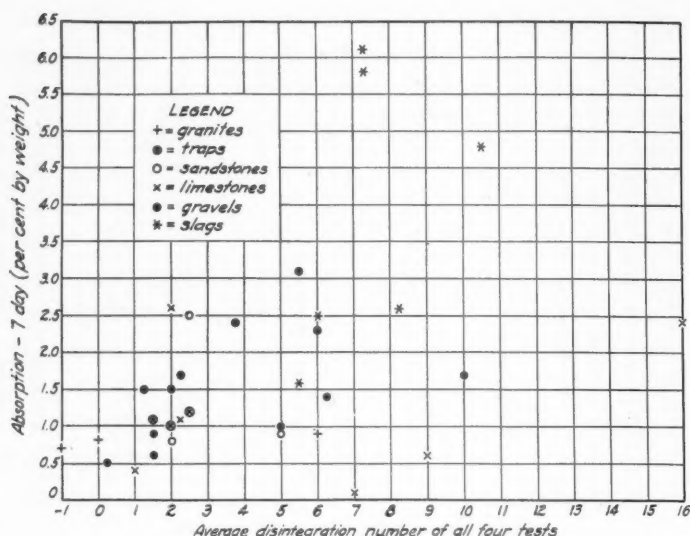


Fig. 1

sodium sulfate and sodium chloride treatments also gave very high numbers. The bond of No. 11 was composed of calcite and hydrated ferric oxide. This rock showed a low disintegration number under all treatments.

LIMESTONES—The sodium sulfate and sodium chloride treatments were not as closely correlated to the freezing tests as were the boiling tests. It is to be noted that the sodium sulfate treatment disintegrated No. 15 to a considerable extent, whereas the sample was practically unaffected in the freezing tests. The results and the petrographic examination strongly indicate, but by no means prove, that an appreciable amount of clay should be considered as indicative of poor resistance, as claimed by Loughlin.[†] Of all limestones that resisted the freezing test but one sample (No. 15) was practically unaffected by freezing but was the limestone most severely attacked by the sulfate treatment. This is a confirmation of Jackson's opinion[‡] that all samples resistant to sulfate treatment are resistant to freezing but that samples resistant to freezing are not all resistant to sulfate.

GRAVELS—With two exceptions none of the gravels was composed wholly of one type of rock. All gravels withstood freezing and thawing treatment well, with the exception of one sandstone (No. 26) and one schist (No. 29), each of which was slightly disintegrated. As in the case of crushed granite (No. 3), granite gravel (No. 19) showed no disintegration through freezing and thawing but marked disintegration in the sodium chloride treatment. Sodium sulfate also caused disintegration of No. 19.

The gravels composed mainly of quartz, except No. 23, resisted freezing and thawing about the same as they resisted the other

three tests. The sodium sulfate test, for limestone gravels, and either the sodium sulfate or the sodium chloride treatments for sandstone, appear satisfactory for predicting the results of freezing and thawing tests. The resistance of limestone gravels to freezing was inversely proportional to the slight amount of clay found in the samples. The results of the boiling treatments on the gravels are not in good accord with the resistance to the sodium chloride or the sodium sulfate treatments.

SLAGS—Using the freezing tests as the criterion, the sodium sulfate test gave results in agreement in three cases (Nos. 31, 33 and 34), and quite divergent results in the others (Nos. 32, 35 and 36). The boiling treatment gave results diametrically opposite to these from the sodium sulfate tests. The sodium chloride test in five cases was in fair agreement with the freezing test.

(D) The Relation of Absorption and Porosity to Disintegration

1. Absorptions and Porosities

To determine whether the percentage of absorption was correlated with the disintegration of the samples, Figs. 1 and 2 were prepared. The 7-day absorption values (from Table I) are plotted in Fig. 1 against the average disintegration produced by all four tests, and in Fig. 2 against the freezing disintegration only. The points in both figures are widely scattered. There is a trend showing increase in disintegration number with increase in absorption. However, the relation is so vague that the absorption is of no value as an indication of the resistance to disintegration.

In Fig. 3, a rough correlation between absorption and disintegration is indicated. The average disintegration for all the tests for each class of aggregates (limestone, gravel, slag, etc.) is shown plotted against the average absorption of each group. Absorption and disintegration increase progressively through the granites, the traps,

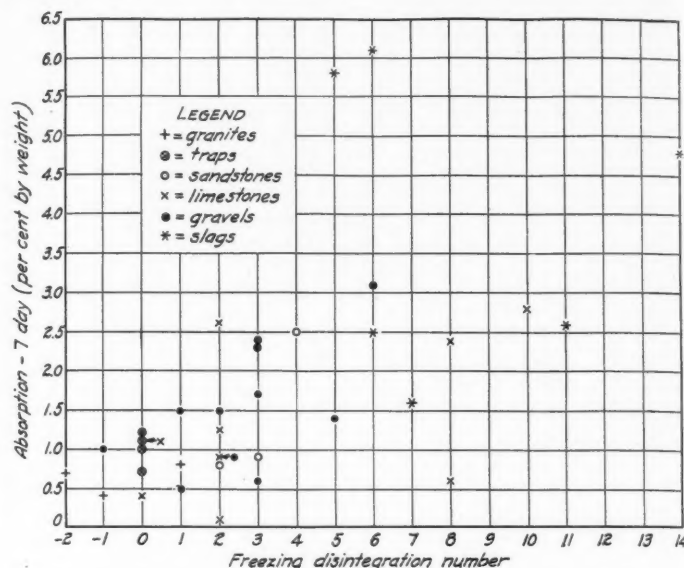


Fig. 2

gravels, limestones to the sandstones, which have the highest values for both absorption and disintegration when the rocks only are considered. The slags do not fit into this relation, having a high absorption with only the same average disintegration as the limestones. For the rocks a small increase in absorption from one class to the other was accompanied by a greatly increased disintegration. This relation is not applicable for judging the resistance of a particular rock to weathering, because individual members vary so widely from the mean.

The relation between porosity and absorption for all the materials other than slag is represented in Fig. 4. The equation $P = 3.3A$ represents all points fairly well, and the groups of points for each material group about the line.

A straight line to represent the relation between the absorptions and porosities of the slags would not pass through the origin. If the representative line be drawn parallel to the line for the natural rocks it would intersect the axis at the 8% point. That is, when the absorption is zero the porosity of the rocks is zero, but when the absorption of the slags is zero the porosity is 8%. This may be interpreted as meaning that an average of 8% of the void space of the slags represents closed cells to which the water has no access while in the natural rocks there is only a small amount of such cells.

Since a connection between the absorption and the porosity is indicated and the absorption is not definitely enough related to the resistance to disintegration to be of value, the porosity likewise cannot be used as an indication of the resistance of rocks and slags to disintegrating forces.

2. The Kreüger and Schurecht Criteria

The Kreüger criterion was originated for judging the resistance of ceramic bodies to weathering. Schurecht substituted measurements which may be made more readily. Kreüger presented data to show that his

[†]ROCK PRODUCTS, March 17, 1928, Vol. 31, No. 6, p. 50.

[‡]Proceedings, Ninth Annual Meeting, Highway Research Board, 1930.

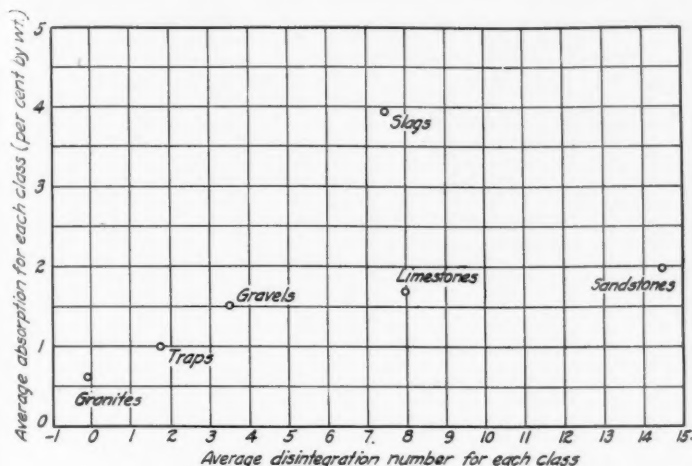


Fig. 3

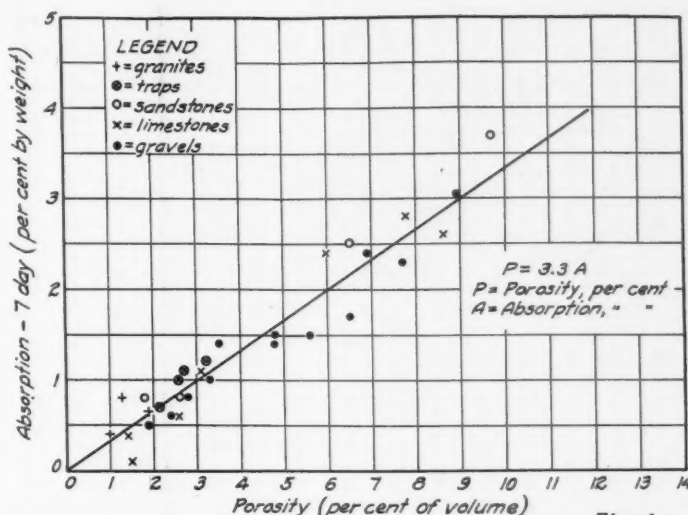


Fig. 4

criterion was applicable to ceramic bodies, and McBurney has in like manner substantiated Schurecht's criterion for clay brick.

The Kreüger ratio K is given by the equation

$$K = \frac{\text{4-day water absorption (vol. per cent.)}}{\text{Porosity (vol. per cent.)}}$$

and the Schurecht ratio S' is given by

$$S' = \frac{\text{48-hour water absorption}}{\text{48 hours + 5 hours boiling}}$$

Since the data required for the Schurecht ratio were not obtained the values of S given in the tables and figures were calculated from the equation:

$$S = \frac{\text{24-hour absorption}}{\text{24 hours + 6 hours boiling}}$$

Water changing to ice increases some 9% in volume. If therefore more than 91% of the pore space of a material is filled with water and the water frozen, internal pressure will be developed. It has been assumed that the numerators of the Kreüger and Schurecht ratios measure the maximum

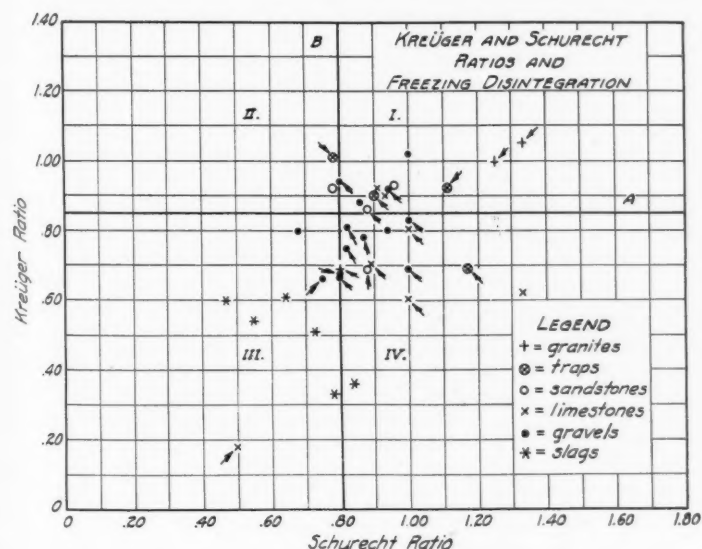
amount of water that will ordinarily be present in a building material and the denominators the total pore space. Therefore if the water be uniformly distributed in the pores these ratios should have a critical value of 0.91. Above this critical value the ice in forming would develop pressure; below this value no pressure would be developed. Since, however, the water cannot be assumed to be uniformly distributed and for other reasons, Kreüger suggested for K a critical value of 0.85, and Schurecht suggested 0.80 as a critical value for S .

Ceramic bodies may be considered as isotropic. Rocks are composed of divers minerals with different physical properties and their disintegration on exposure has been attributed not only to the freezing of entrained water, but to other factors as well. For example, the coefficient of thermal linear expansion perpendicular to the crystal axis is 7.8×10^{-7} for quartz and the coefficient parallel to the crystal axis is 251×10^{-7} for calcite. This large difference would result in considerable stress due to appreciable change in temperature in two such

adjacent minerals. As noted by Loughlin*, the wetting of clay minerals produces a large expansion which may result in disintegration of rocks containing an appreciable quantity of those minerals. The porosity of the materials (neglecting the "closed" pores of the slags) shows a maximum of 9.7% for the natural rocks and a maximum of 20.1% for the slags which is much lower than an average porosity of about 30% found by Kreüger for the ceramic bodies he examined. The materials with the smaller pore space would be subjected to smaller internal forces resulting from the freezing of entrained water. The pore space of the greater portion of the aggregate tested is so small that there is good reason to believe that the Kreüger or Schurecht criteria could not apply owing to the small force that entrained water would exert through freezing. Summarizing, other factors than freezing exert considerable disintegrating influence on aggregates and the Kreüger or Schurecht criterion therefore is less apt to apply.

It is also important to note here that the precision of measure of the Kreüger and

*ROCK PRODUCTS, Mar. 17, 1928, Vol. 31, No. 6, p. 50.



Note: Arrows indicate a Disintegration Number less than four.

Fig. 5

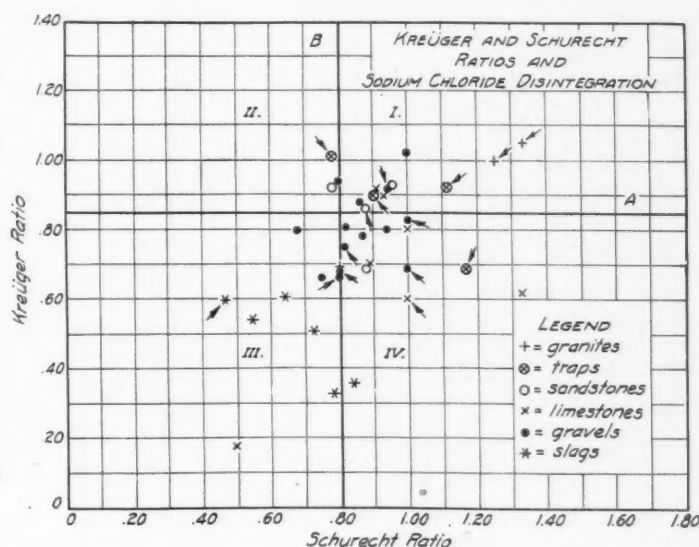


Fig. 6

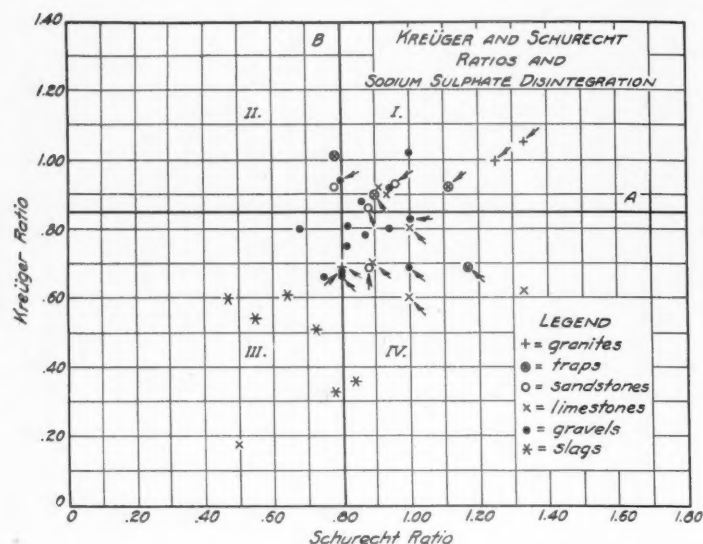


Fig. 7

Schurecht values for materials of such low porosities (see Table I) is so low that they are of no value in individual cases. However, even though the precision be low a correlation between the destruction and the Kreuger or the Schurecht values should be observed. Figs. 5 to 8 show plots of the test data. The poor materials should be in quadrant I, all good material in quadrant III. The arrows indicate material with average disintegration numbers of less than four and should be classed as good materials. There is, however, as may be seen from the figures, no tendency for the arrows to fall in quadrant I and not to be present in quadrant III, and therefore the Kreuger and Schurecht criteria do not apply to the class of materials suitable for concrete aggregates that were examined.

Summary

(1) Three general types of materials: crushed rock, gravels and slags—were tested. The crushed rocks may still be further subdivided into granites, traps, limestones and sandstones.

(2) Four disintegration treatments were used: (a) sodium sulfate solution; (b) sodium chloride solution; (c) boiling and drying; (d) freezing and thawing. The disintegration was measured after subjecting a sample to 150 cycles of one of the treatments listed.

(3) The average disintegration numbers of each type for all the treatments (NaCl, Na₂SO₄, boiling and freezing), was as follows:

| Material | Disintegration number |
|------------|-----------------------|
| Granites† | 0 |
| Traps | 2 |
| Gravels | 3.5 |
| Slags | 7.5 |
| Limestones | 8 |
| Sandstones | 14.5 |

†The result of the NaCl treatment on granite No. 3 was omitted in calculating this value.

It should be borne in mind that the above values are averages and that individual

samples deviated considerably from the average.

(4) Clay inclusions in an aggregate appear to increase its disintegration, and the tests have substantiated Laughlin's conclusion that a petrographic analysis is of value in estimating the amount of clay minerals present. For limestone the residue insoluble in hydrochloric acid should be examined for the presence of clay. The analysis determines the extent of disintegration that has already occurred, but an estimation of the resistance of the materials to destructive action based upon the structure or composition other than outlined above is of little value.

(5) The absorption and the porosity values are useless as criteria of ability to withstand disintegration.

(6) Neither the Kreuger nor the Schurecht ratios can be used as criteria to judge resistance to disintegration of the aggregate. This is probably in great part due to the low porosity of the materials. It is to be noted that the large per cent. of closed pores in slags reduces the active pores to a relatively small figure.

(7) The four disintegration treatments when intercompared do not give concordant results.

(8) The disintegration of the test materials was not due solely to the force of the expansion of water changing to ice or of the crystallization of salts within the solids, since such disruptive action would apparently be proportional to the pore space, whereas the experimental data indicate that pore space and disintegration are almost entirely unrelated.

(9) The tests have substantiated the findings of Jackson† and others, that, with few exceptions, those limestones that will resist the sodium sulfate treatment will also resist freezing and thawing.

†Proceedings, Highway Research Board, 1930. (Not yet published.)

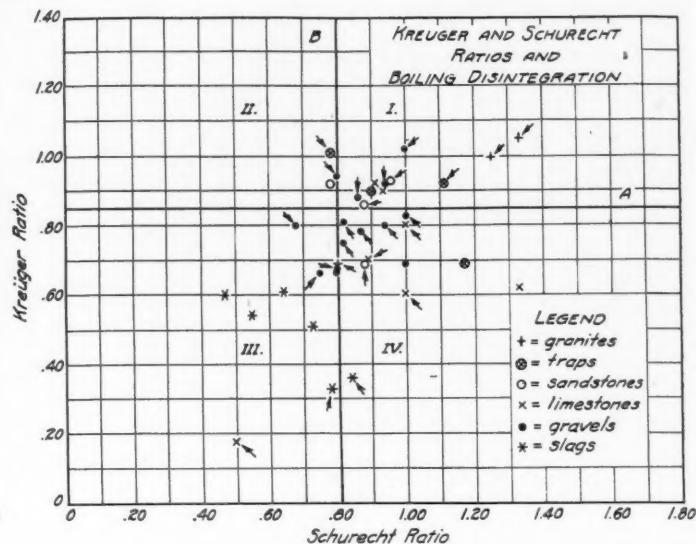


Fig. 8

Acknowledgments

The investigation was begun by Morris Temin, who carried out the experimental work through the fabrication of all test specimens and the testing of the first group of the three-month specimens. Appreciation is due Dr. Herbert Insley who made the petrographic examinations, and to J. Arthur Swenson, who checked all data and computations.

Discussion of Paper by M. Temin, W. Pigman and J. Tucker, Jr.

By A. T. Goldbeck

Director, Bureau of Engineering, National Crushed Stone Association

THE AUTHORS of this paper deserve commendation for the thoroughness with which they have undertaken this investigation and have analyzed the results. Evidently the underlying idea of the accelerated tests performed was to compare them and then select one which might be most indicative and useful. In this they were in part successful but the test results would have had more significance if data could have been presented showing something of the service behavior of the materials tested.

The severity and method of making freezing tests greatly influence the results. The U. S. Bureau of Standards method is not very severe and it is believed that if the freezing test is ever to be made into a useful method for predetermining the soundness of aggregates, it must be made more truly an accelerated test. It must be speeded up and experiments looking in that direction were recently reported by F. C. Lang before the annual meeting of the American Society for Testing Materials.

The sodium sulphate test method used by the authors is quite unusual in that a 14% solution was used rather than a saturated solution. In this they are at variance with the most common practice. The whole sub-

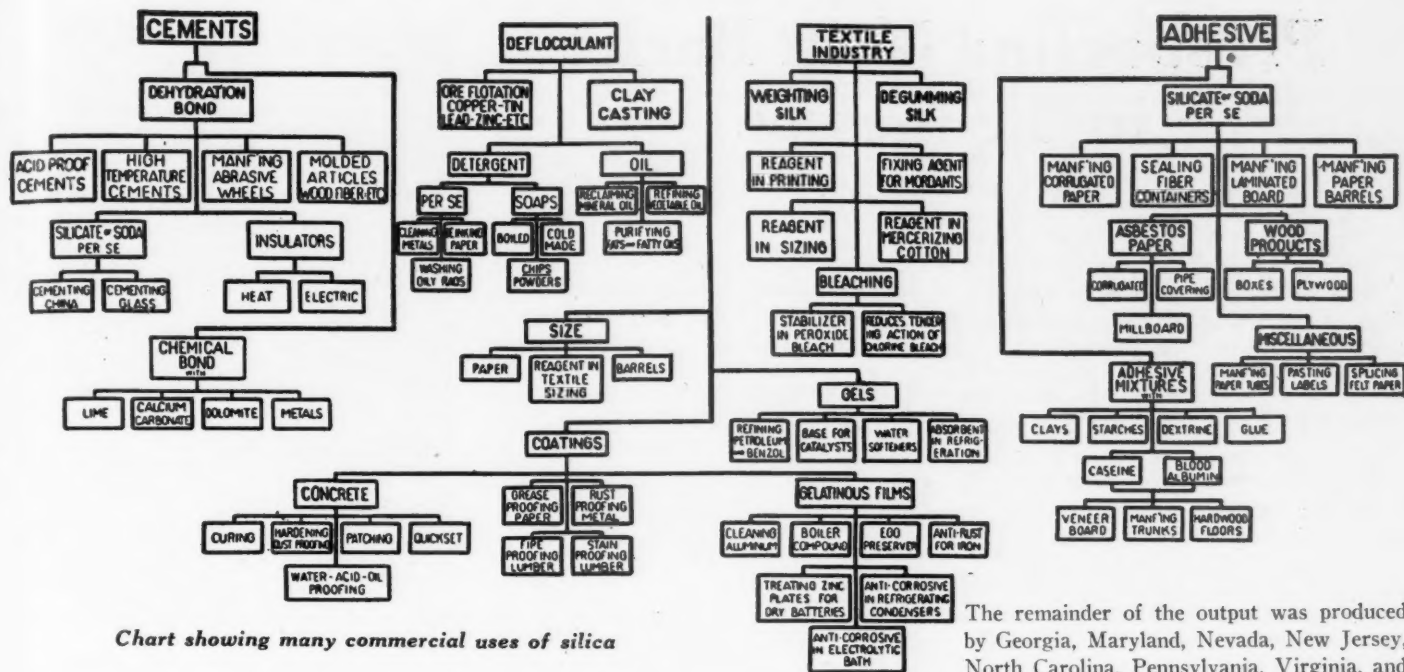


Chart showing many commercial uses of silica

Some Uses of Silica

MANY are inclined to overlook the origin of necessities which they use every day. Few think of the lowly grain of sand as they put on a fresh shirt. Yet, according to the *du Pont Magazine*, large quantities of silica, in the form of silicate of soda, are used each year in the manufacture of laundry soap.

Many other uses of this product, one of the few made from that great natural resource, sand, are outlined in this story, "What Shall We Do With This Mountain of Glass?" The accompanying chart lists the many applications which are made of this important product of sand.

ject of the proper method for making the sodium sulphate test surely needs clarification and more extensive investigation so that results might be duplicated in different laboratories.

The authors have found that the sodium sulphate test gives only a fair agreement with freezing results. The boiling test gave better agreement with freezing than the sodium sulphate or the sodium chloride tests, especially with limestones. It has been the writer's experience that the sodium sulphate test may give entirely misleading results with some limestones which are not at all corroborated by the freezing test or by service behavior.

This matter of service behavior is important when considering the effects of any accelerated test. Certainly, the same test limits should not be specified irrespective of where the aggregate is to be used. Some conditions of exposure are much more severe than others.

The authors' tabulation of data is excellent and should prove to be a valuable addition to the literature of accelerated soundness tests.

Talc Output Decreased in 1930

IN 1930 the talc industry as a whole experienced a depression, which was characterized by lessened demand, a tendency toward lower prices, and keen competition. Practically all producers, however, continued operations, and prices as a whole held fairly firm. Five new operators entered the field in 1930, one each in California and Nevada, two in North Carolina and one in Vermont. On the contrary, two small operators, one each in California and North Carolina discontinued operations.

The total quantity of talc sold by producers in the United States in 1930 was 179,385 short tons, valued at \$2,108,338, according to figures compiled by the United States Bureau of Mines, Department of Commerce, from individual reports furnished by producers. As compared with 1929 these figures represent decreases of 19% in quantity and of 20% in value. The figures comprise 4972 tons of crude talc, valued at \$48,913; 385 tons of sawed and manufactured talc, valued at \$90,370; and 174,028 tons of ground talc, valued at \$1,969,055. There were 28 producers of talc in 1930, three more than in 1929.

Of the total quantity sold, New York state supplied 93,216 tons, valued at \$1,192,604, as compared with 109,543 tons, valued at \$1,439,272 in 1929; or a decrease of 15% in quantity and 17% in value; Vermont supplied 45,881 tons, valued at \$399,548, as compared with 60,469 tons, valued at \$546,658, in 1929, or a decrease of 24% in quantity and 27% in value; and California supplied 14,993 tons, valued at \$219,246, as compared with 17,620 tons, valued at \$256,977 in 1929, or decreases of 15% in both quantity and value. The output of talc from California, New York, and Vermont equaled 86% in quantity and value, respectively, of the total sold in the United States in 1930.

The remainder of the output was produced by Georgia, Maryland, Nevada, New Jersey, North Carolina, Pennsylvania, Virginia, and Wisconsin.

Figures for Georgia, Maryland, New Jersey, New York, North Carolina, Virginia, and Wisconsin, were collected in co-operation with the respective state geological surveys.

Slackened demand was reflected in the imports of talc for consumption in 1930, which amounted to 25,779 short tons, valued at \$529,822, compared with 31,177 tons, valued at \$671,629 in 1929, or a decrease of 17% in quantity and 21% in value in comparison with 1929. With the exceptions of 1928 and 1929, however, the tonnage imported for 1930 was higher than for any year on record.

Toilet grade talc is produced in quantity only in California, and California producers find their principal market in the East. This grade of talc is dutiable at 75% ad valorem, which enables the producers to compete more favorably with toilet grade talcs from Canada, France and Italy. Despite other handicaps, such as transcontinental freight rates and lessened demand, prices were about the same as those prevailing in 1929.

Talc produced in New York is used principally in the paint, paper, rubber, and ceramic industries. Lower prices, declining demand, and sharp competition characterized the industry in this state.

The same may be said of conditions prevailing in Vermont. The product from this state enters chiefly the roofing, paper, paint, rubber and textile industries.

Talc crayons manufactured from high-grade massive talc were produced in Georgia, North Carolina and Vermont. High-grade talc of lava grade was produced in Maryland and North Carolina.

The encroachment of substitutes for talc in some industries is well known and has made some progress, but as new uses are frequently being found for talc, this factor probably does not have a disturbing influence on the industry at present.

Prospecting Vein Barite in Tennessee

By J. R. Thoenen

THE mineral barite or barium sulphate, used commercially as a paint and paper filler, has been mined extensively in the territory surrounding Sweetwater, Tenn., for a number of years. In fact this section is second in production only to that of the Cartersville, Ga., district. The Sweetwater ore resembles that at Cartersville in that it is apparently a residual deposit resulting from the decomposition of the original limestone matrix in which the barite was precipitated. This limestone decomposed by the action of water, air, and frost has left the customary heavy red clay in which the barite occurs in the form of fine sand and gravel with a few large boulders.

The mineral occurs in pockets irregularly distributed over a wide territory and is located by test holes dug by hand. Mining is carried on by steam shovel and the recovered material sent to a washery and treatment plant where the ore is separated from the clay by log washers and jigs of the Hartz type. Recovery varies in different pits but the average is probably near one ton of commercial ore to 10 tons of shovel dirt.

At various times barite in vein formations has been opened in different localities in Tennessee but so far these have been found unprofitable. The veins have invariably narrowed to a foot or less in thickness with development.

Interest has been recently aroused in a vein of barite occurring on the farm of Mrs. Ada Hutson, a short distance southwest of the city of Murfreesboro in Rutherford county. This deposit was brought to the attention of R. F. and A. S. Overall of Murfreesboro, who were in search of other material. For the purpose of investigation they sunk a small shaft nearby a driven well. No barite or other mineral of im-

portance was found in this shaft however.

A short distance northeast of Mrs. Hutson's home, barite was found outcropping in the bed of a private roadway. A shallow test pit was sunk on this outcrop and ore found in considerable quantity in boulder and gravel form imbedded in a heavy yellow clay matrix. Extension of this pit north and south ran out of ore although barite continued in the bottom. Other test pits sunk to the northeast and southwest developed the extension of the deposit in these directions.

Possible Sources of Lead

Galena was found associated with the barite in occasional crystals, and rarely, some small crystals of fluorite. This, together with the absence of any lateral horizontal extension suggested the presence of a vein or fissure deposit. Accordingly a windlass was rigged up and a shaft sunk in the original test pit. This shaft struck solid limestone at a depth of 18 ft. in which the barite occurred in vein formation approximately 4 ft. between walls. The shaft was then continued to a depth of 40 ft. at which the ore had consolidated and diminished in thickness to 2 ft. The galena content had increased somewhat but in irregular patches. There was some evidence of the occurrence of small veinlets of galena in the barite itself.

The vein was found to strike northeast and southwest and to dip to the northwest at about 70 deg. The footwall was clearly defined but showed considerable recent erosion due to descending surface waters. This is further indicated by the presence of from one to six inches of clay between the barite and the limestone footwall. The hanging wall was found to be quite ragged and



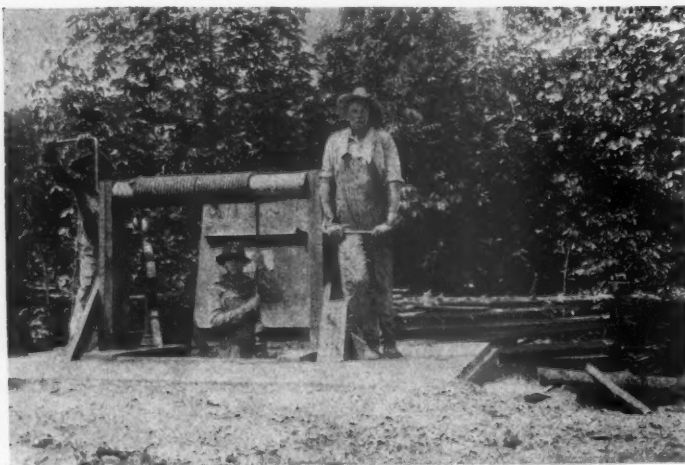
Another test pit showing barite

showed much greater effect of recent erosion. No evidence of vertical or lateral displacement or faulting was noted.

At the bottom of this shaft drifts were driven both ways on the vein and the ore found to continue in each direction in varying thickness.

Surface prospecting was continued and resulted in finding some barite gravel in an old sink hole some 900 ft. southwest of the shaft. Upon further investigation by surface pits near the sink hole the vein was again picked up and a second shaft started. This shaft like the first struck solid limestone walls at 18 ft. with the barite continuing as before. However, here the gravel and boulder ore was confined to a thickness of 30 in. The hanging wall was found to be quite ragged and shot with barite veinlets for a distance of 4 ft. from the vein proper showing a mineralized area of several feet in thickness. This shaft was continued to a depth of 30 ft. with ore continuing in the bottom.

At this point labor became difficult to obtain locally owing to the necessity of har-



Windlass and bucket at No. 1 shaft



The No. 1 shaft and ore dump

vesting farm crops and it was decided to abandon further developments to a more propitious time.

The presence of galena in the ore while a detriment as far as marketing of the barite is concerned, is of importance in its problematical promise for the future. The occurrence of fluorite is in such small quantity as to be negligible. Galena or lead sulphide, however, is commonly found in veins having a barite or calcite gangue. Should this deposit develop an increasing amount of galena with a proportionate decrease in barite with depth it may easily assume importance as a future lead producer. On the other hand should the galena content diminish and the vein continue at its present width there is good promise of a small barite mine. These are things that only can be determined by further development, which the operators plan to carry on in the near future by sinking both shafts to a greater depth.

A point in favor of the vein deposit is the greater ore recovery possible. In the Sweetwater and Cartersville districts the recovery will probably average around 10% of the material mined. A test run on the ore taken from the No. 1 shaft dump showed a recovery of washed commercial ore of 65%. To offset this, however, there will be higher mining and transportation costs.

The absence of any former mining in the immediate vicinity makes this operation of considerable local interest and future operations will be watched in the hope that they may prove the commercial value of the property.

Utah Manufacturers Are Told About Sand and Gravel

THE UTAH Sand and Gravel Products Corp., Salt Lake City, is accorded fine recognition in a recent issue of the *Utah Payroll Builder*, a monthly magazine issued by the Utah Manufacturers Association and which also is the official publication of the Utah Federation of Women's Clubs and the Utah Shippers Traffic Association.

The article in question is entitled "A Mountain of Sand and Gravel" and is written by Eric Ryberg, president of the Utah Sand and Gravel Products Corp., with the primary purpose of showing the manufacturers of his state the importance of the sand and gravel industry in their special and commercial welfare. "It is in the memory of all of us," he says, "when we would drive up to the pit with our teams and stick wagons, shovel on bank-run sand and gravel by hand for all kinds of construction work. It made no material difference what kind of construction, we would use bank-run sand and gravel.

"Today, the science of construction engineering has taught us there is a great difference in sand and gravel, and greater strength values can be secured from these materials by intelligent processing. This has resulted in the present day modern sand, gravel and

crushed stone plants scientifically designed to crush, wash and classify the raw materials of mother nature into a manufactured product to comply with the many and varied specifications for just as many and varied types of construction.

"Sand, gravel and stone deposits, within reasonable distances of markets, have within the past few years become very valuable. They are very rarely sold or purchased on the unit of an acre or lot, but are now surveyed, tested with test holes and blocked out, much the same as our valuable mineral and coal properties. Value is placed on the deposit according to volume content of com-



Photo by Blank and Stoller, Inc.

Eric W. Ryberg

mercial sand, gravel and stone taking into consideration the quality of the materials.

"Modern plants for the processing of these minerals are expensive projects. They are extra heavy power users, the equipment used all demands heavy power requirements for the excavation of the raw materials, the conveying of it to plants, crushing the oversize material to commercial sizes, the screening and classifying, the pumping of water to wash the material is one of the minor requirements but that incidental operation requires a 50- to 100-hp. motor direct connected to single- and double-stage centrifugal pumps and must run continuously to move 1000 gallons or more per minute to the washing screens.

"All the heavy machinery in operation requires substantial plant building construction to withstand the loads and vibration of the machine movement, in addition to the storage capacity of 1000 tons or more. All is built at an elevation high enough to permit of gravity loading into transportation equipment, railroad cars, trucks, etc.

"Such requirements demand expensive and substantial construction to withstand the tremendous load. The investment of these modern plants and properties involves hundreds of thousands of dollars. It is a very ordinary plant that represents only a \$100,000 investment.

"The ability of such a plant to produce the varied grades of processed material is

limited. It is not unusual to see million dollar sand, gravel or rock crushing plants. Most every city in the United States, of 150,000 or over, boasts of million dollar sand, gravel and stone companies. The larger centers have proportionately larger companies.

"One of our neighboring large cities supports a recent consolidation of several companies involving a financial set-up of approximately \$20,000,000. It operates in its delivery system daily over 200 five-ton modern dump trucks involving a capital investment of something like \$6000 per truck, or \$1,200,000 for transportation equipment alone. So it is not hard to visualize with their other large properties the tremendous investment of millions in the sand and gravel industry.

"It is a basic industry with just as great importance as steel, lumber, brick, cement, lime, paint, textiles, oils, etc. It is one of the valuable resources of the nation, playing a most important part and yet of all commodities it is the cheapest by weight, being 25 times cheaper than cement, 12 to 25 times cheaper than brick, 60 times cheaper than steel. The price of a whole ton of material will not pay for a fair lunch; it will hardly buy a couple of good Havana cigars at Salt Lake plant quotations.

"There probably is no commodity in the world that renders so much universal service as the products originating out of sand, gravel and stone. Every man, woman and child and the domestic animals enjoy the facilities and conveniences made possible."

Mr. Ryberg's article is well illustrated. Of particular interest is his description of the company's laboratory where, he says, "the government, both national and local, places engineers at the plants during the time we are furnishing their projects with materials. Their engineers test every carload and no material moves to their projects without having first passed rigid test inspection and having their stamp of approval. The larger construction companies, utilities and corporations have their standards of quality that must be complied with and their interests are usually handled by commercial material engineers engaged in that highly specialized vocation.

"There are times when we operators feel that these engineers promote and insist on much too rigid interpretation of the specification, causing us additional operating difficulties and increased production costs. However, we admit that it is the high standard set up by these experts that has in a large degree elevated the industry to its present important position. In fairness it must be said that most credit is due the associations of allied industries, notably the Portland Cement Association.

"Among my acquaintances, operators who are members of the National Sand and Gravel Association, I find graduates from engineering and law schools, Cornell, Purdue, Pennsylvania, Lafayette, Illinois and other famous national schools. There is no doubt of the value of an engineering and law training, but the sand and gravel producer of today must, in addition, have at least a working knowledge of freight rates, marketing problems, income tax matters, cost accounting and truck transportation.

"Even though I have spent 15 years in the active management and operation of fairly large plants and properties, I must modestly confess there is a considerable amount I do not know about the business. Just about the time I know all there is to know about the business some young cub engineer will come along and show us all some wrinkles we didn't know were there."

History of the Roman Cement Industry in Central Europe

By Dr. C. R. Platzmann

IN 1924 the one hundredth jubilee of the invention of the portland cement was celebrated. This celebration was really in error, for the cement produced by Joseph Aspdin was a portland cement merely by designation; in truth, it was a Roman cement, which had the most essential qualification, viz., the burning to the sintering point, so it could be regarded a portland cement. For this knowledge the industry is indebted to Isaac Charles Johnson,¹ who in 1844 produced in the White plant for the first time a portland cement by burning a raw mix to sintering.

The Roman cement made by Aspdin, which he calls merely portland cement since it simulated the portland stone popular in England as a building stone, was anything but new. The much earlier labors of Frost, Dobbs, John and Vicat had already come at least very close to that of Aspdin.

In central Europe the Roman [cement] production goes back to the 1829 prize essay of the Haarlem Society of Natural Sciences, by Professor Dr. T. N. Fuchs.^{2 3}

The fact that Fuchs pointed out the rich deposits of lime marls in Tyrol and Bavaria, stimulated the erection of many lime plants and Roman cement factories, from which developed later on the present day portland cement plants. In 1832 Panzer⁴ quoted building contractors and authorities, in witness to the successful use of Roman cement in marine and land construction. In spite of the many lime plants, which at that time produced Roman cement in Bavaria, difficult transport, expensive fuel, fluctuating composition of the marl hindered a greater expansion.

In Upper Bavaria, at Perlmoos and Gartenau in Austria, and in the vicinity of Ulm there were excellent deposits of raw mate-

rial, which naturally contained lime and clay in the correct composition. The first Roman cement plants came into existence about 1855 in the vicinity of Muenich. The prestige of Roman cement was so great that



An old shaft kiln on the Bavarian-Austrian border

it could develop and maintain itself even long after the invention of the portland cement. From a production of 8,335 tons in 1865, the quantity increased to 100,000 tons in 1879, but since then has declined in favor of portland and natural cements. The price of 1.70 M. in 1870-78 showed also a recurrent tendency and was in 1905 1.15 M. per 50 kg. (about \$1 per 376-lb. bbl.)

Dr. G. Leube furthered the development of an extended Roman cement industry in the vicinity of Ulm. He found lime marl near Blaubeuren, which corresponded with the compositions given by Fuchs, and after experiments this led to the erection of the

first cement plant in 1838 in Ehrenstein. The small lime kiln was fired by an open wood fire, and the material burned exactly as Aspdin had prescribed it in his patent, i. e., up to the dissociation temperature of the carbonate of lime. A small water power plant of 35 hp. served to drive the crushers and the mills. In 1841, in order to secure a uniform product, a screening plant was installed.

Leube also found suitable lime marls near Allmendingen and influenced the erection of a Roman cement kiln there. The quality of this Roman cement was so good that it withstood competition from portland cement until 1882. The lime marl analyzed 68 to 72% CaCO_3 . In 1876 a concrete chimney of 115 ft. height was built in Germany from this Roman cement and is in use even to this day. E. Schwenk, in 1847 started the burning of Roman cement in Gerhausen and Allmendingen.

The composition of the Roman cement produced in Upper Bavaria is indicated by an analysis of V. Schwarzenbach:⁵

| | |
|---|-------------|
| SiO_2 | 22.4% |
| $\text{Al}_2\text{O}_3 \cdot \text{Fe}_2\text{O}_3$ | 13.6% |
| CaO | 57.7% |
| MgO | 1.6% |
| MnO_2 | 1.8% |
| CO_2 | 2.1% |
| | <hr/> 99.2% |

Roof tile made from Roman cement in Staudach near Muenich, and a roof made with Staudach cement in 1847, are still today preserved in excellent condition. A direction for use preserved from the year 1852 prescribes:

"This cement is applied in all cases where the influence of the water or of the moisture is to be dealt with successfully.



The Leube natural cement plant at Ehrenstein



Quarry and first Leube kiln near Allmendingen



Another old natural cement kiln, built in 1873

"This cement to be used with clean, washed river sand:

"1. On damp places or on walls which are exposed to the air and the weather: Two parts of cement and 3 parts river sand.

"2. In water construction: Three parts cement and 2 parts river sand.

"If a wall finish or also another work in cement is dried out completely, one can apply upon the same—in spite of its black-gray color—any desired earthy color and also whitening lime."

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²Erdmann's Journal fuer technische Chemie, 1829, vol. 6, pp. 1-26, 132, 162.

³Dingler's Polytechnisches Journal, 1833, vol. 49, p. 271.

⁴Kunst- und Gewerbeblatt fuer das Koenigreich Bayern, 1832.

⁵Heinrich von Gerstenbergh: "Die Cemente."

To Erect New Lime Rock Plants

WITH THE FILING of an application for charter for the Perry Lime Rock Co. in superior court at Macon, Ga., June 24, it developed that two new lime rock plants were to be started there about July 1. This will make four lime rock plants in the county.

Scientific tests have been made, it is announced, on the property to be used by the new plants, these showing that the material meets specifications of the highway department of Georgia and other states for paving.

It will take 30 days to obtain a charter and in the meantime equipment is to be ordered so that operations can begin without delay. Each plant will employ about 30 men, it is stated.

The Central of Georgia railway is to extend a spur track to one plant and the Southern railway will serve the Grovania plant.—Macon (Ga.) Telegraph.

Dumping of Soviet Asbestos Blow to Canadian Industry

THE RECENT DUMPING of 120,000 bags or approximately 6000 tons of crude asbestos upon the United States market by the Russian government, through its agents, the Amtorg Trading Corp., has further demoralized that industry and has caused severe curtailment in operations of asbestos companies operating in Canada. The United States had been chiefly dependent on Canada for its supplies. Not only have large shipments to the United States been made by Russia, but prices have been cut drastically. Formerly asbestos sold at above \$500 per ton, but the Russian product has been offered at \$350 per ton, and latest offers of Russian raws are reported at well below that figure.

While Asbestos Corp. of Canada has found marketing conditions difficult for some years, the situation has become acute now. This is reflected in the stocks of the company. The preferred shares are quoted to 85 c. and the common at 25 c. bid to 40 c. asked. Profits after depreciation in 1929 amounted to \$18,333. In 1930 the operating loss was \$89,068, and the net loss, after charges, was \$1,229,002.

The slump in the asbestos trade began in 1929 when the first crude shipments from Russia began. Since then they have increased materially. The one Russian shipment noted above is almost on a par with monthly shipments from Canada, which in February this year were 7120 tons. Asbestos Corp. has been forced to reduce prices to meet competition.

To strangle the American and Canadian asbestos industry and to supply the needed asbestos goods of the world, seems to be the ultimate aim of Russia. This will be an easy matter, as no capital investment was needed to acquire the Russian mines, having been forcibly taken from their former owners. There is no competitive or free labor market in Russia. The people are compelled to accept wages arbitrarily fixed by the government.

By way of reprisal for the opposition of the Canadian government in placing an embargo on Russian materials, the Soviet government has issued orders forbidding Russian importing organizations and trade representatives abroad to buy any Canadian goods or use Canadian shipping. It is estimated that between one and two million dollars worth of Canadian trade is affected.

The hearing on alleged unfair treatment in the United States in the sale of Russian asbestos, which was to have been held on May 19, has been postponed indefinitely. In the meantime, all imports of Russian asbestos are to be placed in bond pending investigation of the charges. Bonding the imports will protect the interests of both the Russian importers and United States producers.

International Congress for Testing Materials

THE FIRST International Congress of the New International Association for the Testing of Materials will be held this year September 6 to 12 in Zurich, Switzerland. The Association consists of individuals and companies in the various countries.

The objects of the Association are to secure international cooperation, exchange of views and experience in regard to all matters connected with the testing of materials. The chief means of securing this result is the holding of periodical International Congresses at intervals of from 3 to 5 years.

The technical program has been divided into four groups of which Group B on non-metallic inorganic minerals is as follows: (1) natural stone; (2) portland cements; (3) cements with hydraulic ingredients, trass, pouzzolana, santorin earth and blast-furnace slag; (4) alumina cement; (5) concrete, strength, elasticity, compactness; (6) influence of chemical agents on cement and concrete; (7) reinforced concrete.

Americans, all members of the American Society for Testing Materials, will have a prominent part in the program. The following authors will give papers in Group B: W. A. Slater, research professor of engineering materials, Lehigh University, "Designing Concrete for High Strength, Low Permeability and Low Shrinkage," and F. E. Richart, associate professor of mechanics, University of Illinois, "Stresses and Strains in Reinforced Concrete Columns."

Steps are being taken to arrange traveling facilities for all who wish to take part in the Congress. Visits of technical interest will be organized and all necessary arrangements are being made to render the stay in "The Playground of Europe" enjoyable.

W. H. Fulweiler, the A.S.T.M. representative on the permanent committee which governs the International Association, is chemical engineer of the United Gas Improvement Co., Philadelphia, Penn. Further details may be procured from him or from C. L. Warwick, secretary, American Society for Testing Materials, Philadelphia.

Basic Phosphate Slags

A COMPOST of basic phosphates is made (1) by decanting Thomas flour or other basic phosphate slags in water, adding an acid or acid solutions and evaporating, (2) by wet grinding in the presence of acids or acid salt solutions, (3) by disaggregation with acids under high pressure or (4) by the action of finely pulverized acids or acid salt solutions on the slags. This French patent No. 692,511 describes the selective elimination of CaO from basic slags by treatment with acids or acid salt solutions, so as to leave unmodified the constituent called silicocarnotite which is the solvency vehicle in citric acid.—Chemical Abstracts.

The Hardness and Toughness of Rock

An Effort to Classify Rocks for Drilling and Blasting by Laboratory Tests

AT ONE OF THE MEETINGS of the American Institute of Mining Engineers, two or three years ago, an important paper, "The Hardness and Toughness of Rock," was presented by Emile E. Gyss and Henry C. Davis, both of the School of Mines, Columbia University. The subject is one that interests quarrymen quite as much as it interests miners, the problems of drilling and blasting being practically identical in quarry and mine.

The paper begins by discussing present methods of determining hardness and then proposes practices based on the actual energy used in drilling and blasting.

There are two recognized methods for determining hardness, one which is purely theoretical, being to multiply the percentage of each mineral in the rock by its hardness according to Moh's scale, adding the products and dividing by 100. This is the method proposed by R. M. Raymond.

The second method, developed by the Bureau of Public Roads, Department of Agriculture, is one with which producers of road material and concrete aggregate are generally familiar. It consists in grinding off a specimen of standard shape and size on a disc with quartz grains used as an abrasive. The loss of weight from grinding during a definite period of time is a measure of the hardness of the rock. It will be seen that this method measures the effect of abrasion and does not take resistance to impact into

account. As impact is such an important factor in drilling, a purely abrasive measurement is not enough to compare rocks for drilling.

The results by the Bureau of Public Roads method were changed to compare with the Moh scale of hardness by a calculation based on the relative hardness of some of the rocks. In this way a table was formed which showed the hardness of each rock tested according to the units of the Bureau of Public Roads (found by the abrasion method described), the same hardness reduced to Moh's scale, and the hardness calculated by Raymond's method. On some rocks, chert, rhyolite, and granite, the methods check closely. On limestone and marble the figures are far apart. But in a general way the methods check one another.

The practical method first proposed by G. Townsend Harley, and approved by the authors of the paper, is to drill the rock under test conditions. From the depth and diameter of the hole and the drilling speed the energy used may be calculated and this is a true measure of the hardness or the "drillability" of the rock.

The test drilling conditions are described by the authors as follows:

The machine drill should be of standard make, preferably Ingersoll-Rand, as these rock drills are widely distributed and have been carefully tested on Quincy granite. A stopper drill, operated vertically, is preferable, for this eliminates variations due to the drill runner, and also reduces friction of the drill bit on the side of the hole. Air pressure should be constant at 80 or 90 lb. per sq. in.

The bit should be a double-taper cross-bit, with a 90 deg. cutting edge. The bits should preferably be 1 7/8-, 1 3/4-, and 1 5/8-in. diameter. The hole should be collared to a depth of about 2 in., then a new steel used and run for about 1 min. The depth of hole and its average diameter should be obtained so that both the drilling speed and energy per unit volume cut can be calculated. From five to ten tests on each different type of rock would give useful results. As complete a description as possible of the rock should likewise be given so that it may be properly classified.

In this test there are still a number of variables. By using as new a machine as possible, however, or one recently overhauled, the difference of energy developed by new and old machines will be considerably decreased. Steel tempered by standard methods should largely eliminate the variable hardness of the drill-bit.

It is the conclusion of the authors of the paper that if a sufficient number of such test drillings be reported there can be formed a table of such nature that comparisons may be made with it to show

whether or not an individual operation is getting the results it should in its drilling practice. It will also be of value in starting an operation, to determine about what drilling speed may be expected and what the cost per foot would be.

Toughness

A toughness test, according to the authors, should show the relative amount and strength of explosive needed for economical breaking. An actual powder consumption test is unsatisfactory because planes, slips and fractures are always present and introduce variables. The authors say:

In addition to toughness, in any given rock, the following factors will influence the powder consumption per unit of rock broken: (a) the strength and character of the explosive; (b) depth, size, number and orientation of holes; (c) desired size of the blasted product, and (d) number of free faces of rock blasted.

Two methods are in use for determining toughness (without reference to blasting) by the Bureau of Public Roads. One employs the Page impact machine, the other the Deval abrasion mill, both machines which are familiar to producers of road material, concrete aggregate and railway ballast. The accompanying tables give the toughness as found by the drop test (Page machine) and the Deval machine. In the middle column the hardness of ordinary limestone is taken as unity (Ls = 1).

In conclusion the authors say:

The foregoing compilations of tables of rock hardness and toughness have been ob-

TABLE I.—HARDNESS OF ROCKS

| Rock | A. | B. | C. |
|-----------------------|------|------|-------|
| Chert | 19.4 | 6.95 | 6.95 |
| Quartzite | 18.9 | 6.77 | 6.63 |
| Hornblende granite | 18.6 | 6.67 | ..... |
| Feldspathic quartzite | 18.5 | 6.63 | 6.10 |
| Rhyolite | 18.3 | 6.55 | 6.55 |
| Granite | 18.3 | 6.55 | 6.54 |
| Fresh diabase | 18.3 | 6.55 | 6.04 |
| Augite syenite | 18.3 | 6.55 | ..... |
| Diorite | 18.2 | 6.52 | 6.26 |
| Trachyte | 18.1 | 6.48 | 6.33 |
| Syenite | 18.0 | 6.45 | 6.30 |
| Biotite granite | 17.9 | 6.41 | 6.49 |
| Basalt | 17.8 | 6.38 | 6.09 |
| Granite gneiss | 17.7 | 6.34 | 6.51 |
| Gabbro | 17.7 | 6.34 | 6.14 |
| Hornblende gneiss | 17.6 | 6.30 | 5.80 |
| Amphibolite | 17.5 | 6.27 | 5.82 |
| Andesite | 17.0 | 6.09 | 6.17 |
| Hornblende schist | 17.0 | 6.09 | 5.60 |
| Mica schist | 16.9 | 6.05 | 5.20 |
| Biotite gneiss | 16.1 | 5.95 | 5.92 |
| Biotite schist | 16.1 | 5.77 | 5.50 |
| Calcareous sandstone | 15.8 | 5.66 | 5.41 |
| Chlorite schist | 15.4 | 5.52 | ..... |
| Slate | 15.0 | 5.38 | ..... |
| Dolomite | 14.9 | 5.34 | ..... |
| Feldspathic sandstone | 14.6 | 5.23 | ..... |
| Sandstone | 14.4 | 5.16 | 6.13 |
| Peridotite | 14.2 | 5.09 | 6.28 |
| Limestone | 14.1 | 5.05 | 3.70 |
| Marble | 13.1 | 4.69 | 3.20 |

A. Hardness according to units of Bureau of Public Roads, determined by the abrasion method.

B. The same hardness calculated to Moh's scale of hardness (1 to 10) used with all minerals.

C. Hardness of the same rocks according to Raymond's method of multiplying the percentage of each mineral in the rock by its hardness on Moh's scale.

TABLE II.—ROCK TOUGHNESS

| Rock | Toughness Drop Test in Cms. | Toughness Relative Ls.=1 | Toughness Deval Test Ls.=1 | Relative Wear Ls.=1 |
|-----------------------|-----------------------------|--------------------------|----------------------------|---------------------|
| | | | | |
| Diabase | 25 | 2.8 | 2.28 | ..... |
| Basalt | 20 | 2.2 | 1.80 | ..... |
| Feldspathic quartzite | 20 | 2.2 | 1.73 | ..... |
| Pyroxene quartzite | 19 | 2.1 | 1.73 | ..... |
| Amphibolite | 19 | 2.1 | 1.80 | ..... |
| Altered diabase | 19 | 2.1 | 1.93 | ..... |
| Rhyolite | 19 | 2.1 | 1.35 | ..... |
| Andesite | 18 | 2.0 | 1.28 | ..... |
| Altered basalt | 18 | 2.0 | 1.66 | ..... |
| Diorite | 17 | 1.9 | 1.66 | ..... |
| Slate | 17 | 1.9 | 1.14 | ..... |
| Quartzite | 17 | 1.9 | 1.51 | ..... |
| Hornblende schist | 16 | 1.8 | 1.14 | ..... |
| Augite syenite | 15 | 1.7 | 1.51 | ..... |
| Gabbro | 14 | 1.6 | 1.66 | ..... |
| Calcareous sandstone | 14 | 1.6 | 1.20 | ..... |
| Hornblende gneiss | 14 | 1.6 | 1.25 | ..... |
| Chlorite schist | 14 | 1.6 | 1.16 | ..... |
| Hornblende granite | 13 | 1.4 | 1.31 | ..... |
| Feldspathic sandstone | 13 | 1.4 | 0.81 | ..... |
| Granite | 12 | 1.3 | 1.35 | ..... |
| Chert | 12 | 1.3 | 0.54 | ..... |
| Peridotite | 11 | 1.2 | 1.25 | ..... |
| Biotite schist | 11 | 1.2 | 1.09 | ..... |
| Sandstone | 10 | 1.1 | 0.81 | ..... |
| Granite gneiss | 10 | 1.1 | 1.10 | ..... |
| Mica schist | 10 | 1.1 | 0.93 | ..... |
| Biotite granite | 9 | 1.1 | 0.93 | ..... |
| Limestone | 9 | 1.0 | 1.00 | ..... |
| Dolomite | 9 | 1.0 | 0.91 | ..... |
| Biotite gneiss | 8 | 0.9 | 0.86 | ..... |
| Marble | 6 | 0.7 | 0.88 | ..... |

tained by using the Moh scratch test determinations of mineral hardness and the data of the U. S. Department of Agriculture. Alphabetical values for the hardness classification of rocks have been replaced by quantitative values, as those possess a clearer and more definite meaning to the engineer. To supplement these hardness values, a standardized method of determining drilling speeds and energy consumption per unit volume drilled has been suggested. With the data from these tests available, a table can be compiled from which the drilling speed

influence the size of the broken material brought down by blasting.

Although there is a general relation between drilling speed and amount of explosives required to break a drift round, this relation is not by any means constant and can be used only in some cases for estimating the quantity of explosives required to break a round. The qualities of the rock that cause the ground to resist fracturing, or the formation of planes of weakness, by external forces probably indirectly influence the amount of explosive required to break a

their removal. This interest in rock gardens apparently can be interpreted as additional evidence of the trend toward suburban and rural residences. Landscaping of homes, especially country places, is a potential outlet for waste stone available at all quarries. It is used not only in rock gardens but for stepping-stone walks, steps, walls, fountains, and miscellaneous similar purposes. Sale of quarry waste material for use in landscaping should not be expected to develop into a large market but, if the revenue is sufficient to aid in paying the cost of the clean-up crew, it is certainly worth the attention of every quarry superintendent.

TABLE III.

| Rock | Average drilling speed, in. per min. | Amount of explosive per ft. advance in drift | Bureau of Public Roads Classification | | |
|-----------------------|--------------------------------------|--|---------------------------------------|--------------------|-----------|
| | | | Hardness | | Toughness |
| | | | Of sample | Average from table | |
| Quartzite | 8.2 | 4.6 | 16.7 | 18.9 | 16 |
| Quartzite | 7.4 | 4.8 | 16.7 | 18.9 | 16 |
| Rhyolite | 4.0 | 10.7 | 18.0 | 18.3 | 8 |
| Rhyolite | 6.2 | 7.6 | 16.0 | 18.3 | 12 |
| Siliceous limestone | 8.0 | 6.1 | ----- | ----- | ----- |
| Ferruginous limestone | 14.0 | 8.4 | 14.7 | ----- | ----- |
| Limestone | 5.3 | 10.9 | 16.0 | 14.1 | 9 |
| Limestone | 5.9 | 8.3 | 16.0 | 14.1 | 6 |
| Limestone | 6.3 | 10.4 | 13.0 | 14.1 | 5 |
| Marble | 7.8 | 10.0 | ----- | 13.1 | ----- |
| Marble | 8.3 | 9.5 | 13.7 | 13.1 | 9 |

in any given rock, under standard conditions, may be closely estimated.

The table for relative toughness should likewise be supplemented by information regarding character and quantity of explosive required for breaking the most economical rounds in all kinds of rock. If determinations along the lines proposed by Harley (results from actual blasting) were carried out in a large number of rocks, very useful information would certainly be available.

Discussion

A long and animated discussion followed this paper, for the subject is one which is of the deepest interest to every man who has to do with drilling and blasting. But the information added by the discussion was mostly of a negative nature, showing that other conditions than hardness and toughness, as shown by laboratory tests, were more important in their effect on actual breaking of rock. This was brought out quite clearly in the written discussion of E. D. Gardner of Tucson, Ariz., who gave a table compiled from experience in a drift (tunnel) at the Copper Queen Mine, Bisbee, Ariz., showing that there is little or no relationship between hardness and toughness as determined by the Bureau of Public Roads and the speed in drilling and the explosive required.

Mr. Gardner concludes that:

Rock in metal mines almost invariably contains planes of weakness and jointing planes. The plane of weakness in the rock is the greatest single factor governing the amount of explosive required to break a given round. This has been demonstrated by observing the results of blasting over 150 test rounds in various mines. The effect of planes of weakness is so important that, generally, any variation of resistance offered to the explosive due to differences of toughness of the rock, as defined in the paper under discussion, would be masked. It will be noted from the table that the index for toughness cannot be applied to the quantity of explosives required to break a round in the series of tests shown. However, other tests indicate that the hardness and toughness of the rock as determined by the Bureau of Public Roads methods appear to

round. These same qualities that affect the planes of weakness also probably influence the speed of drilling, and when this is the case there is a direct relation between drilling speed and the amount of explosives required to break the ground.

Canadian Fertilizer Plant Uses Florida Phosphate Rock

A SHIPMENT of 1100 tons of phosphate rock from Florida reached New Westminster, B. C., Canada, recently for the Triangle Chemical division of Canadian Industries, Ltd. This is the initial shipment of a considerable quantity of phosphate rock which will come by the water route to this fertilizer plant. The material cannot be obtained in Canada in a suitable quality.

The Consolidated Mining and Smelting Co. of Canada, Ltd., hoped to obtain its supplies of phosphate from the Fernie district but found the deposits were of an inferior grade. The new fertilizer plant at Trail is also importing the product.

Phosphate rock is the basis for all complete fertilizers according to L. A. Murphy, manager of Triangle Chemical plant. The local industry has met with a good demand for its products this season and stocks of both raw materials and fertilizers are low. As a consequence manufacture will be commenced immediately the new shipment of phosphate rock comes in.—*New Westminster (B. C.) British Columbian*.

Rock Gardens

THE NATIONWIDE CRAZE this season for bigger and better rock gardens has created an unprecedented demand for ordinary field and quarry stone. It is not an uncommon sight in some localities where suitable rocks are scarce to see a "For Sale" sign on a pile of stones near a farmer's field; stones which have accumulated as a result of repeated plowings, and which normally could be had for the asking with thanks for

Potash Extraction from Texas Polyhalite

EXPERIMENTS on the production of potassium chloride by the evaporation of leach liquors from decomposition of uncalcined polyhalite by boiling saturated sodium chloride solutions, by H. W. Storch and F. Fraas, have recently been reported in United States Bureau of Mines report of investigations No. 3062. A brief summary of the findings follows:

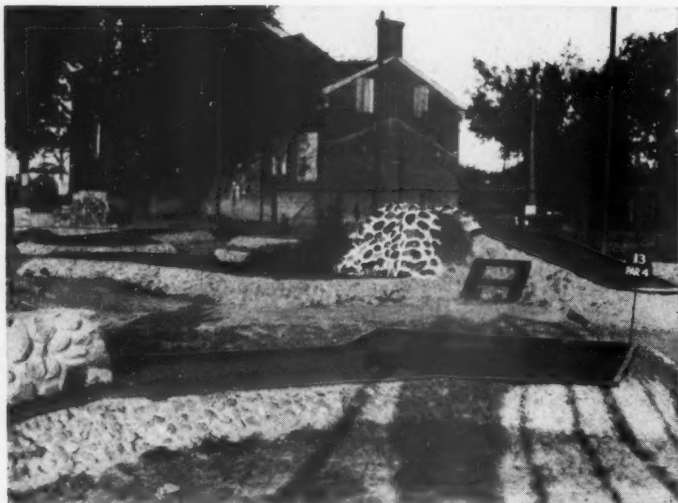
The evaporation of brines obtained by leaching uncalcined polyhalite with boiling saturated sodium chloride solutions was studied. It was found that evaporation of 90% of the water interspersed with three crystallization steps will yield 78% of the potash as crude KCl, the bulk of the impurities being NaCl. This product may be readily refined (by a recrystallization process similar to that used in treating sylvinites), so as to produce pure KCl. A preliminary cost estimate indicates about \$20 per ton as the cost of production (at the plant in Texas). The possibility of the presence of industrially workable deposits of sylvinites in Texas or New Mexico is mentioned in connection with the possible industrial application of the process herein described for the production of KCl from polyhalite.

To Build Chemical Products Plant in Washington

PLANS FOR A PLANT for the manufacture of chemical products from chemicals found in the mountains at Silverton, Wash., were revealed recently when articles of incorporation of the Lambda Chemical Products Co. were filed with County Auditor John Haugen. The incorporators and trustees are O. Robert Dahl and Lulu A. Dahl.

The company is capitalized at 3,000,000 shares of no-par value stock of which the initial no-par capital stock is \$18,000.

Powers of the company include the developing and reducing of ores and minerals, retorting of mercury, and the manufacture of calcium arsenate and other compounds, including fertilizers, potassium nitrate and sodium nitrate.—*Everett (Wash.) Herald*.



A course at Rochester, N. Y., where stones have been painted various colors to add gaiety



Blue Bird Golf course, Buffalo, N. Y., where varied uses of stone have been made

A New Customer for Stone

**Midget Golf Looks Like a Small Outlet
But the Total Tonnage Is Remarkable**

THE CRAZE for midget golf which has been sweeping over the country during the past year or two has called for thousands of tons of stone in various forms and the end is not yet in sight. Even when moving indoors for the winter it is surprising how the builders call for stone to make the waterfalls around the columns and some walks to give that "atmosphere" which the club swinger feels he must have for the best strokes.

For the outdoor courses, stone has been

used in about as many ways as there have been builders and fortunately no one has been able to take out a patent on placing it in any certain way and then sit back to collect the royalties from those who want to build in the same way. Fifty tons is a common amount for use on one course and in many cases several times this quantity has been used to advantage.

One of the most unusual uses was found on a homemade course at Clingan, Penn., where Claude L. Krammes hauled what he

needed from the nearby trap rock quarry of the John T. Dyer Quarry Co. He used it to outline the greens in lieu of a home supply of iron pipe or 2x4's, which the professionals sometimes think necessary for this purpose. The fact that it has proven satisfactory in this case was demonstrated when scores of people came several miles from the city of Reading to pay and play.

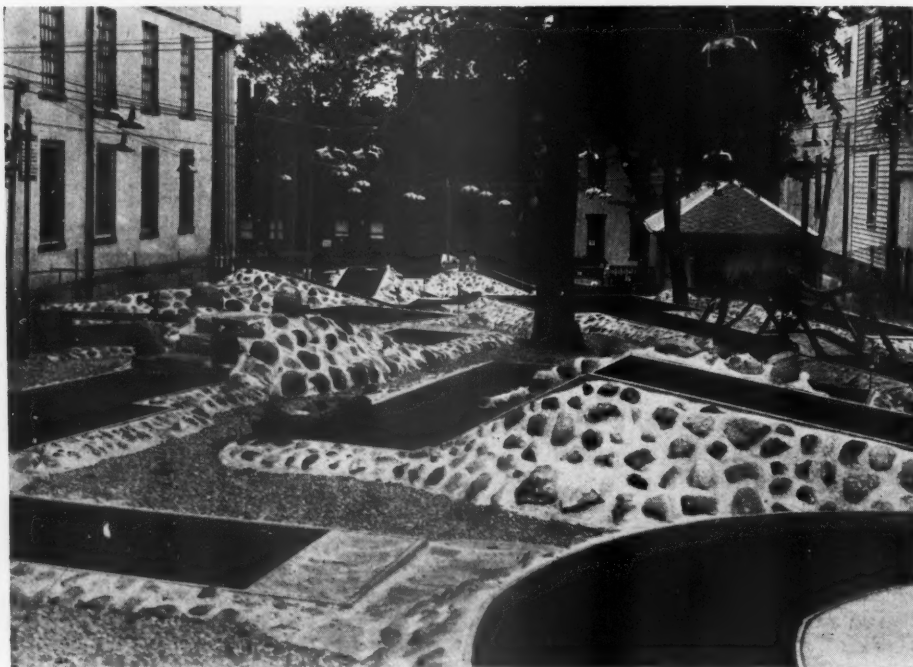
The More Stone the Better the Course

It was not long in the life of the new pastime before the owners of the courses learned that crushed stone forms about the only "sod" which will not wear out under the continual tramping of hundreds of feet every hour. It was also found that a stone bank offered less inducement to run up and down than soft grass and that it was far more durable.

A course which has applied both of these principles was found at Geneva, N. Y., where the builder had set his stones in cement to hold the banks. This same builder also used bricks and hollow tile to form some of the hazards.

The Blue Bird course on Columbia parkway, Buffalo, N. Y., has several elevated tees as shown in one of the views. They differ in form but in general are all built up with an ordinary masonry wall and, located on a crushed stone field, give the player that sense of traveling more as he walks up and down and around.

Some builders have added a touch of color to their courses by painting the stones different colors. An instance of this was found in Rochester, N. Y., where A. Camarado, a



Riverview course, Geneva, N. Y., with stone walks and banks



Honeymoon trail golf course, Geneva, N. Y.

contractor and home builder, has built two courses after his own ideas of how to improve on Nature's dress.

On Honeymoon Trail

At Grèce, N. Y., on the Honeymoon trail leading to the Falls, a course was found which fitted nearly ideal conditions for the question of economically going into the business. The corner of an old meadow, with an unusually tough sod, had been fenced off and with 50 tons of run of quarry stones and two tons of "worm eaten" specimens a playground had been created which was making good money for the owner.



Claude L. Krammer's course, Clingan, Penn., using stone from the quarry of John T. Dyer Quarry Co.

Another Editor Reviews State Cement Plant Operation

MICHIGAN will be lonesome without the Chelsea cement plant. It was difficult to get out a newspaper following the close of the World war. It will be correspondingly difficult to talk politics in Michigan without that cement plant, now that Governor Brucker has signed the bill providing for disposal of it.

However, adjustment to the new situation will come in time, and, then, doubtless everybody will be glad that the ghost that has walked the night, and the daytime as well, since 1921, has been at last effectually buried.

Whether Governor Groesbeck had merely a political idea in mind or a truly sound one, beneficial to the state in a financial way, when he made the purchase, opinion will continue to differ. There may be a mellow, in-between notion that, perhaps Governor Groesbeck had a thought to play effectual politics and do a stroke of good business at the same time. If the cement plant had been a paying one and had turned in a profit of \$600,000 instead of a deficit of that amount, the experiment would not have been bad politics. The Groesbeck idea that the state-owned plant would serve to keep the big cement concerns of the state in some measure submissive was not a bad political idea, it must be admitted.

Two Minds on Public Ownership

The American public is curiously minded about public ownership. It is against it in theory, but it has a relish for special instances of public ownership, especially where they work well against big business. In other words, the dear public, like most of us, is glad to eat its cake and keep it, too, whenever it can be arranged—which is not often.

But whatever political advantage there must have been in the Chelsea cement plant now must have completely passed. Inasmuch as the plant is stated to have cost the state \$600,000 in a deficit from its operation, of course there is no longer any justification in its retention.

It would be interesting to know if any considerable saving was ever brought to the state, in the price of cement, by virtue of ownership and operation of the plant. Here again, the public is curiously on both sides of the question. The public in some instances thinks it highly inconsistent for state government to become the competitor of business in the state. But in respect to some other businesses, the public apparently thinks it all right for the state to directly oppose in a competitive way. In other words, the public seems to have favorites among the business organizations. Inconsistencies are difficult to explain, and there is not much use in trying.—*Lansing (Mich.) State Journal.*

Effect of Grading of Gravel and Sand Weights on Voids

An Abstract

By Edmund Shaw
Contributing Editor

THE ENGINEERING AND RESEARCH DEPARTMENT of the National Sand and Gravel Association has given an entirely new presentation of the relation of voids and unit weight to gradation in its recent publications in the *Bulletin* of the association.

Most of the experimental data were secured in the latter part of 1928 and 1929. Early preliminary studies were published, and Stanton Walker, director of engineering and research of the association, appended a paper on the subject to his report made to the national convention, January, 1930. This was reviewed in *Rock Products* at the time. The new presentation includes much more than what had previously been published. It gives much more space to a discussion of the results and the endeavor to derive general laws from the results which may be applied to all gradations and percentages of voids.

So much has been published in the past two years concerning voids and grading by the National Crushed Stone Association, the National Sand and Gravel Association and individual investigators that it seems quite safe to assume that the reader is familiar with the main conclusions that have been drawn from their investigations. Almost everyone who is at all interested knows that the lowest voids are obtained by mixing 30-40% of fine with 70-60% of coarse, leaving out the medium size altogether. It is also well known that as the medium size is added the percentage of voids increases and that the maximum voids are to be found in a product in which the grains are all of the same size, regardless of whether the grains themselves are fine, medium or coarse. Hence a consideration of the first part of the present paper may well be omitted from this review.

Valuable Information Brought Out

In the recent presentation of the subject the latter part brings out some interesting and practical information. What follows is condensed from the paper: With the gravel studied, a weight of 100 lb. per cu. ft. corresponds to 37% voids with gravel and to 38% voids with sand. [Of course this would vary with the specific gravity of different materials. The Potomac gravel tested had the somewhat low specific gravity of 2.55. With the more usual specific gravity of 2.60, the weight would be 102.4 lb. for 37% voids and 100 lb. would correspond to 38.5% voids.—Editor.]

A change of 3% in the percentage of voids corresponds to a 5-lb. change in weight with the particular gravel studied. Variations in grading can change the percentage of voids about 8%, from 33.5% to 41%

measured dry and loose, and from 29 to 37% measured dry and loose. The maximum voids are found, as before stated, where the grains are all of the same size.

In these tests minimum voids in gravel were obtained with 30-40% of the No. 4— $\frac{3}{8}$ -in. (fine) with 70-60% of $\frac{3}{4}$ -1 $\frac{1}{2}$ -in. (coarse). Additions of the medium $\frac{3}{8}$ -in. to $\frac{3}{4}$ -in. increased the voids. The amount such additions increase the voids may be studied on one of the triaxial diagrams with which the paper is illustrated. To do this the reader is directed to draw a line from the point representing 35% of No. 4— $\frac{3}{8}$ -in. and 65% $\frac{3}{4}$ -1 $\frac{1}{2}$ -in. to the point representing 100% of the intermediate size, $\frac{3}{8}$ - $\frac{3}{4}$ -in. To save the reader's time the reviewer has drawn this line as A-C on the triaxial diagram reproduced here. Every point on this line has the fine and the coarse in the proportion of 35:65. The effect of adding percentages of the $\frac{3}{8}$ - $\frac{3}{4}$ -in. may be noted in reading percentages on the right-hand side and following the horizontal lines to A-C. The voids may be determined from the nearest curve of equal voids. Thus the line from 30 on the right intersects the line A-C near the curve of 31% voids, showing that the addition of 30% $\frac{3}{8}$ - $\frac{3}{4}$ -in. material has increased the voids from 29% (as shown at the point A) to 31% (at the intersection). Further additions are shown to increase the voids to 36% when the mixture becomes 100% of medium size.

For mixtures of $\frac{3}{8}$ - $\frac{3}{4}$ -in. with $\frac{3}{4}$ -1 $\frac{1}{2}$ -in. the minimum voids were found with 65% of the coarser and 35% of the finer. But only about 2% change resulted from varying the proportions of these two sizes. Additions of the No. 4— $\frac{3}{8}$ -in. size up to 30-40% decreased the voids. Further additions increased them. The line B-D in the triaxial diagram, drawn as before from directions given in the paper, showed this, the added

percentages being read off on the bottom line

Combinations of No. 4— $\frac{3}{8}$ -in. and $\frac{3}{8}$ - $\frac{3}{4}$ -in. showed about the same range as combinations of the two coarser sizes. The 65-35% combination gave the minimum voids and the range was about 3%. Additions of the coarse ($\frac{3}{4}$ -1 $\frac{1}{2}$ -in.) up to 60-70% tended to decrease the voids. The decrease was from 34 to 31% (about) for the dry and rodded and from 39 to 35% for the dry and loose measurement.

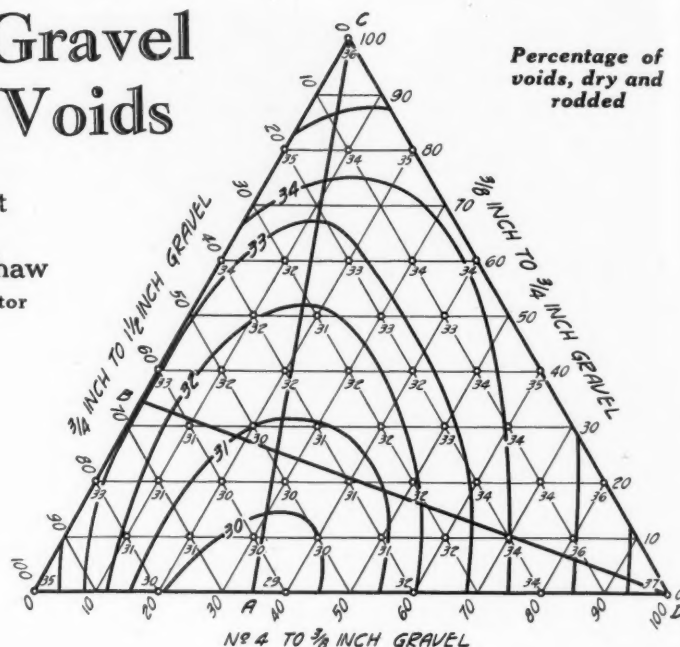
Decreasing Voids

The report says of this study:

"In the discussion given above the recurrence of the approximately 35 to 65% combination of a smaller and larger size as giving the least voids will have been noted. This and further study of these data leads to the observation that, for the sizes used in these tests, the addition of a finer material up to 30 to 40% or a coarser material up to 60 to 70%, operated to decrease the voids. The amount of decrease depends upon the combinations involved.

"It is of interest to the user and producer of gravel to point out specifically that the addition up to about 30 to 40% of No. 4 to $\frac{3}{8}$ -in. size gravel to any combination of $\frac{3}{8}$ -in. to 1 $\frac{1}{2}$ -in. gravel will cause a decrease in voids. The actual percentage of voids which will be obtained, however, will depend on the proportion of sizes in the $\frac{3}{8}$ -in. to 1 $\frac{1}{2}$ -in. material. For example, averages of the dry and rodded and dry and loose measurements will show 30 to 40% of the No. 4 to $\frac{3}{8}$ -in. size producing voids ranging from 31% where the larger material is all coarser than $\frac{3}{4}$ -in. to about 35% where the larger material is finer than $\frac{3}{8}$ -in.

"Only a few tests were made in which the No. 8 to No. 4 size was added. For the few combinations tested the data show in general that the addition of this finer size up to 20%,



the limit of the tests, decreased the void content."

The report emphasizes that the combinations with low voids are not necessarily best from the viewpoint of strength, but they do give the greatest yield of concrete.

Regarding voids in sand, the report says that the results of tests show the same general relations between gradation and voids as with gravel. Combinations of fine and coarse, omitting the intermediate, gave lowest voids, and combination of two adjacent sizes, fine-intermediate or intermediate-coarse, showed a small range in voids. Additions of a finer size up to 40% or a coarser size up to 60% caused a decrease in voids.

As in the earlier report, attention is called to a diagram showing the approximate limits of the usual specifications for concrete sands. (These center around a mixture having about 40% voids, roughly composed of 40% Nos. 4 to 14; 50% Nos. 14 to 48, and 10% finer than No. 48.) Two sands were tested. The contour curves were exactly similar in shape for both, but the percentages of voids were higher in one than the other. This was most marked in mixtures containing more of the finer sizes and was ascribed to the fact that one, giving the lowest voids, had more extremely fine material than the other. This, of course, did not show in the ordinary sieve test. The difference was in material which had all passed the finest sieve used.

Iron Ore and Gravel Washing Methods

AN ARTICLE in a recent issue of *Engineering and Mining Journal* describes recent improvements in methods used in washing iron ores on the Mesabi range. Nowhere have washing methods been studied more intensively, as with the lower grades of ore small differences in recovery or cleanliness of product may make the operation profitable or unprofitable. It is interesting to note that the development of methods and machines has paralleled the development in gravel washing methods to some extent. That is, plants for both materials are coming to simpler flow sheets and more efficient machines.

A few years ago the iron-ore washing plant was a complicated affair of trommels, log washers, turbo-washers and concentrating tables, and the recovery was not so good as it has since become with a more simplified flow sheet. Better classification and concentration, it was found, could be made in the simple Dorr bowl classifier, which took the place of chip tanks, turbo washers and tables. Vibrating screens were found to be more efficient and more satisfactory in other ways than trommels (revolving screens) and this has generally been found true in the washed gravel industry, because it is a good washer, but it seems that the special type, the Dorr washer, gives better results than any ordinary form. Careful

test on the Mesabi range showed that it washed cleaner, removing more "painty" material and that it gave more attrition than log washers. This led to a better handling of "frozen silica" or cemented gravel, as it is called in the gravel industry.

The article gives figures of test runs which tend to substantiate the statements just made. As a result of these test runs the newest plant to be built has a very simple flow sheet. The iron ore goes to a vibrating screen; the oversize goes to a crusher and back to the screen and the undersize goes to a 16x30-ft. Dorr washer. The overflow from this, carrying the fines, goes to a Dorr bowl classifier. The products of these machines go to bins or to waste. Where more than one size of gravel and one of sand are required, sizing screens would have to be added, otherwise the flow sheet would do, as it stands for a sand and gravel plant, which would have a large output occupying small space and require a minimum of repairs. In fact there is at least one plant with this flow sheet in which the above statement is verified.

British Sand and Gravel Washer

THE ENGLISH MAGAZINE, *Cement, Lime and Gravel*, describes a gravel washer which has some interesting features. It employs the counter current flow principle, the flow of the water being against the flow of the material, so that the cleanest water comes in contact with the cleanest material first.

The cylinder which forms the body of the washer is divided into two compartments by a baffle. That into which the material first falls contains dirty water, the overflow from the clean water compartment. The material after being agitated and scrubbed by lifters is put into the next compartment by elevat-

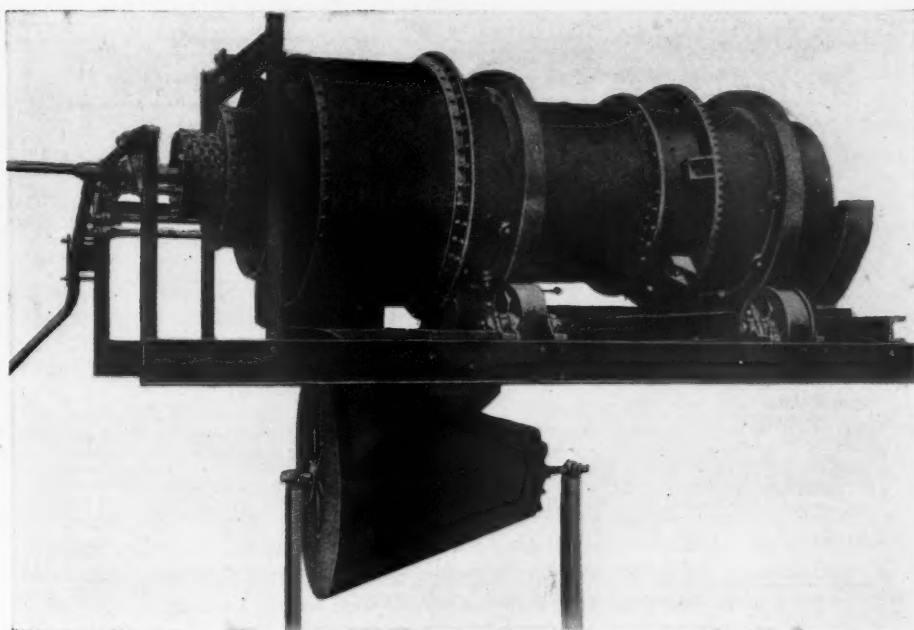
ing blades. It falls into cleaner water and is scrubbed and rinsed. Then it is lifted to a set of screens by which it is sized. The undersize of the finest screen is sand and water and it is dewatered in one way or another. In the illustration the sand and water are shown going to a mechanical dewaterer, which is described as follows:

"This dewatering machine comprises a steel cone rotating upon a horizontal shaft, and having a number of steel blades which form pockets so arranged that the water at certain angles overflows, leaving the settled sand in the pockets to travel to the opposite side of the machine before being discharged." (In passing it may be worth mentioning that a machine of the same type fitted with screens instead of plates is a very good screen for fine materials.)

Seems Similar to Sand Tipples of Mississippi Valley

This gives a complete washing and screening plant in a very small space. But there are three installations of the device shown in the article and in all of them the sand is apparently dewatered in hoppers like the sand "tipples" so much used for dewatering pump discharges in dredging operations on the rivers of the Mississippi Valley. The sand hopper is a continuation of the bins for holding the gravel.

The largest size of the machine is 10 ft. long and 6 ft. diameter, and this is said to have a capacity of 350 tons per day, presumably 8 hr., and to require only 14 hp. to drive. There would seem to be no reason why the machine should not be built much larger for larger tonnages. Washers 20 ft. and even 24 ft. long, employing the counter current principle, have been used in washing phosphate rock in the Tennessee fields and for washing gravel and crushed stone in many parts of this country.



English gravel washer

Good Charge Accounts Backbone of Rock and Gravel Business

Consolidated Rock Products Co., Los Angeles, Calif., Has Well Developed System and Methods

By Willis Parker

OMAR KHAYYAM SAID: "Take the cash and let the credit go." Modern merchants have transposed his precept in the light of twentieth century business methods, and now a good credit plan, having proved its worth in the stormy vicissitudes of depression, forms the backbone of many a sound business. It is, of course, not a case of taking the credit and letting the cash go, but rather an extensive program of co-operation between buyer and seller, which has been worked out to such a fine point that actual losses are extremely light.

It has worked so well for several years in the case of the Consolidated Rock Products Co., with headquarters in Los Angeles, Calif., probably the largest distributor of rock products in the world under a single management, that the story of Leon Rosenbaum, general credit manager of the corporation and its subsidiaries, is of particular interest at this time, when credit managers the country over are scratching their heads in search of new ideas, new methods and new means by which the prospective buyer can be aided in getting—right now—what he needs.

By no means, of course, does the Consolidated Rock Products Co. scorn the buyer who arrives with cash in hand. He gets his discount for cash and it is a profitable transaction, quickly closed. Many of its

customers, incidentally, are cash buyers who have their eyes on that profitable cash discount. But, says Mr. Rosenbaum—and this is the meat in the coconut—"the man with a good credit rating, who pays his bills promptly when due and whose name is on our books, is more likely to buy all of his materials from us, rather than shop around and buy from a dozen different sources."

"In other words," said the credit manager, "we are in business together, the customer and ourselves. We are interested in furnishing our customer materials at right prices, at the time designated, and getting our money when it is due. We are in touch with him; he with us. What we attempt to do is to so cement these relations with our customer that when he thinks of building materials and rock products he thinks of the Consolidated Rock Products Co. So the credit system we have evolved really forms the backbone of the business. It pays, too. Our credit losses are less than $\frac{1}{4}$ of 1% of our annual sales, which run into the millions of dollars."

Establishment of Credit Accounts

The company covers a field that is broad and long and naturally its credit system is an elaborate one. It maintains 16 branches

with 45 distributing points dotting a territory more than 150 miles in length from Santa Barbara to San Diego. When a new customer is developed by the Consolidated Rock Products Co. sales force, and he desires credit, he fills out a general information card, with the usual questions about his financial standing, outstanding obligations, backing, etc. When found satisfactory, after careful investigation and checking, notice is sent to the accounting and sales departments and a new page on the ledger is headed up, the order is numbered and the sale proceeds. He is at once placed on the list for direct mail advertising.

A master credit card is then created for him, containing all of the information obtained and on which space is reserved for the addition of subsequent information. It is, in fact, a miniature business history of the customer. This is recorded in a visible file of the tray type with signals that enable clerks in the department to quickly gain an accurate conception of his general status. So that he may obtain materials quickly, a smaller card is sent to the branches bearing his name and other information, reflecting the establishment of credit with the company. Replacement cards immediately note any change in his status.

Keeping Records Up-to-Date

The California law provides that a "notice of completion" may be published when a job is completed, which is usually done. This list is published daily in a legal paper devoted to the construction industry. It is checked over every morning to determine whether any of the completed jobs represent the work for which Consolidated company furnished materials not yet paid for. A note of it is made and it reappears in the files automatically every 15 days. If payment has not been made the contractor is again notified, and, failing in this, a letter is then sent to the owner advising him of the situation and of the possibilities of a lien on the property. This, of course, applies to extreme cases.

The state law provides that if the material is sold to a contractor or sub-contractor, the seller has 30 days from the date of recording notice of completion in which to file a lien. If sold to the owner, 60 days are allowed. If no notice of completion is published, 90 days are permitted. But the credit department of Consolidated company assumes that

| | | | | | |
|--|--|---------------------------------------|------------------|----------------------------|--|
| THIS APPLICATION | | CONSOLIDATED ROCK PRODUCTS CO. | | C.R. 1 3M 9-29 1931 | |
| Positively Must Accompany | | APPLICATION FOR CREDIT | | 19 | |
| EACH NEW ACCOUNT | | | | | |
| Name | | | | | |
| <small>(FIRST NAME IN FULL)</small> | | | | | |
| Mail Address | | | Residence | | |
| Occupation | | | Telephone | | |
| How Long in City? | | Former Address | | | |
| | | <small>(CITY AND STATE)</small> | | | |
| Amount of Credit Wanted | | | | | |
| Does Applicant Own Real Estate? | | | Value \$ | | |
| How Long in Business? | | | | | |
| Sand—Rock—Gravel—Where Purchased Before | | | | | |
| Banks With | | | Branch | | |
| Reference | | | | | |
| Reference | | | | | |
| Reference | | | | | |
| Remarks | | | Salesman | | |
| Print above information. If more than one member in firm give names and initials of each. | | | | | |
| If operating under Trade-style—show names and initials of members. | | | | | |

Form to be filled in when applying for credit

| | | | |
|-----------------|-------|-------------|---------|
| FULL NAME | | SALESMAN | |
| PRIN OF FIRM | | LICENSE NO. | |
| FORMER ADDRESS | | CREDIT FILE | DUN |
| TRADE REFERENCE | | BMDCA SPEC. | OK'D BY |
| | | BMDCA | |
| | | YEAR | CODE |
| TRADE REFERENCE | | | |
| | | | |
| TRADE REFERENCE | | | |
| | | | |
| BANKS WITH | | | |
| | | | |
| OCCUPATION | PHONE | DATE | |

Master credit card

all bills are 30-day ones and each particular account is kept after through the system of checking and double checking. A list of liens filed also is published. This is clipped from the paper, snipped into individual paragraphs and each item that pertains to one of the company's customers is pasted on his master card in the file.

All bills are payable on the 10th of the month following date of purchase. After due allowances are made, a list of past-due accounts is made out by the credit department about the 18th of the month.

The 30-, 60- and 90-day accounts are segregated. Notices are mailed at once to delinquents. No response sends the account to the collection department by the 25th, unless there are mitigating circumstances which have developed. The collector has an opportunity to visit the job and note its status as to completion and by this method the credit department is accurately advised, so

that in case notice of completion is not filed promptly, the 90-day period for lien filing will not have inadvertently elapsed. Incidentally, the Consolidated company files no liens until a title company has reported on the property, reflecting its legal status as to title, encumbrances and other pertinent data.

In addition to sending credit instruction cards to the various branches a list of customers whose accounts are to be watched is also mailed out. These are not necessarily customers whose credit has been stopped entirely, but usually those who have gone beyond the credit limits set. Should application be made by any such customer for materials, the clerk must telephone the credit department for instructions. The department will check the customer's standing and order the materials delivered or decline the order. The word of the department is final and it maintains a complete and accurate supervision of thousands of customers' accounts and their respective jobs. Instant

Form C-R-5 2M 7-19-30 R.R.B.S.Inc. 700-9389

NAME _____ 19____

ADDRESS _____

CITY _____

ORDER NUMBERS REQUIRED yes SEND INVOICES IN no

Mail Extra Copy of Invoice and Statement to:

TO ACCOUNTS RECEIVABLE BOOKKEEPER:
We have today opened a Credit Account for the above.

Credit Department

Notice to bookkeeper

touch with all branch offices and plants is had by telephone and by messengers.

"Our system works well," declared Mr. Rosenbaum. "By systematic handling and a close-knit organization our credit losses are kept down to a bare minimum. The more thorough and painstaking the examination of the customer's standing before the initial granting of credit the better.

"Credit accounts are really satisfactory only when all terms of the initial agreement are fulfilled by both buyer and seller. I believe that through the system we have adopted after several years of trial the careful check, step by step, that we are able to accomplish, the credit system can and has been converted not only into a safe method of doing business, but a very material business builder."

Form C-R-3 2500 4-18-29 J.B.Co. 72714

TRinity 0241 CREDIT DEPARTMENT

CONSOLIDATED ROCK PRODUCTS CO.
Seventh and Los Angeles Streets
LOS ANGELES, CALIF., _____

Please be advised that your account for the month of _____
amounting to \$_____ is now past due. We will appreciate your prompt
remittance.

Interest charged on overdue accounts.

All Accounts are payable on the 10th of the month following the date of invoice

Notice that account is in arrears

Federal Trade Representatives Investigating Milwaukee Cement Contracts

TWO MEMBERS of the Federal Trade Commission, Washington, D. C., are in Milwaukee, Wis., to investigate whether the cement industry is violating the Sherman anti-trust law. No statement as to the situation in the city would be made by either of the investigators, R. F. Milwee, Jr., and I. D. Royal.

The men conferred with Joseph Nicholson, city purchasing agent, July 11, with reference to the purchase of cement by the city. Cement contractors and exhibitors were likewise interviewed.—*Milwaukee (Wis.) Journal*.

Bell Cement Plant Project Killed

SOUNDING the death knell of Alphonzo Bell's cement mill project, the Los Angeles, Calif., city council July 13 unanimously adopted ordinances repealing Mr. Bell's special zoning permits.

The burial of the cement plant and rock crushing project will be complete when Mayor Porter signs the two repealing measures.

On motion of Councilman Davis the two repealing ordinances were adopted following a suspension of the rules.

One act repeals the law excepting a large area in the Santa Monica mountains from the residential district. The other repeals the ordinance which would have established a spot zone in which the Bell plant could have been erected.

The council instructed the city attorney to draft the repealing ordinances July 10. In order to clear the way for the repeal the council first rescinded the action of the old council in ordering the two Bell permit ordinances submitted to the people at the next general municipal election in 1933.

The measures had been prevented from becoming effective by the presentation of referendum petitions containing more than 30,000 signatures of property owners.—*Los Angeles (Calif.) Examiner*.

State-Owned Cement Plant Reports Record Week

THE BIGGEST sales day at the end of biggest week in the history of the South Dakota state cement plant was July 11, George Philip, chairman of the cement commission, announced recently.

Sales for the day totaled 10,140 bbl., bringing the total for the week up to 36,370 bbl. The last previous high record day was June 8, 1931, with 7000 bbl. sold.

The large demand was credited by cement plant officials "partly to paving."—*Sioux Falls (S. D.) Argus-Leader*.

New President for Portland Cement Association

THE directors of the Portland Cement Association have elected to the presidency of the organization Edward J. Mehren, now vice-president of the McGraw-Hill Publishing Co.

By electing a president from outside the industry who will devote his whole time to the position, the Portland Cement Association, so the chairman of its board, Frank H. Smith, announces, has broken precedents of long standing. Heretofore the leader of the association has been a president of one of the portland cement manufacturing companies. During his term of office he has not only guided the



Edward J. Mehren

work of the association but has also continued to operate his own company. The duties of association president are so heavy, however, that the industry felt it unfair to continue to impose this burden upon the president of any one of its member companies.

Mr. Mehren was editor for ten years of *Engineering News-Record*. Later, he became vice-president and editorial director of the McGraw-Hill Publishing Co., and latterly has been in charge of the company's activities in the Middle West, with headquarters at Chicago. He has been at various times a member of the executive committee of the New York Building Congress and father of its well known craftsmanship awards system; director of the American Road Builders Association, member of the committee on highways and motor transport of the U. S. Chamber of Commerce; chairman of the Marketing Problems Committee, Illinois Manufacturers Association. He is a member of the American Society of Civil Engineers, of the Western Society of Engineers, the University Club, New

York; the Union League Club, Chicago. He is a graduate of Loyola University, Chicago, and of the University of Illinois. Mr. Mehren assumes his new office September 1.

Order Dust Suit Against California Cement Plant

MANY MONTHS' AGITATION by farmers and residents of Cowell, Calif., and the Clayton Valley for county cooperation in an abatement suit against the Cowell plant of the Cowell Lime and Cement Co. brought forth action when the county board of supervisors instructed District Attorney Hoey to start the proceedings.

Mr. Hoey informed the board that the plant is shut down at present and will remain idle for several weeks and probably months, as the result of overproduction and the necessity for repairs to the plant, and was then instructed to bring suit against the plant as a public nuisance at a time which he thought would be most appropriate.

Mr. Hoey said that the suit he will bring against the company will ask that the plant be closed down to abate a public nuisance.

Late in 1930, ranchers and residents of the district appeared before the board of supervisors and asked their cooperation in filing a suit against the company seeking the abatement of the plant or the installation of dust arresters, charging that dust from the plant was spreading over their orchards, vineyards and lands and ruining the value of the property and its products.

Subsequent meeting dragged along until May, when William E. George, manager of the plant, was given his last opportunity to present his plans before the board and failed to do so.

July 10 the supervisors instructed Hoey to file the suit.—*San Francisco (Calif.) Examiner*.

Texas Cement Production in 1931

PRODUCTION of cement at Texas plants during the first half of 1931 amounted to 2,916,000 bbl. compared to 3,442,000 bbl. during the first half of the preceding year, according to the Bureau of Business Research at the University of Texas.

"Shipments totaled 3,018,000 bbl. in 1931 and 3,556,000 bbl. in 1930," the Bureau's report said. "Stocks at the end of the first six months were 1.9% smaller in 1931 than in 1930.

"Output during June increased by 5.8% over May. Shipments mounted 12% in June. The usual seasonal increase in shipments for this period is 5.4%. In spite of this more than seasonal increase over May in shipments, however, the total for June was 1.8% less than during the corresponding month of last year while production was 14% greater than in June, 1930. The production figure was the highest on record for June."

Cement Manufacture and Markets in the British Possessions of North America

AS AN EXPORT MARKET for American cement, Canada presents practically negligible possibilities, except for such special varieties as white and quicksetting cement. With conditions of manufacturing in Canada fairly similar to those in the United States, American cement could hardly expect to overcome transportation costs and imposts with any degree of success, and Canadian cement can not compete in the United States for the same reasons.

Canada's development has been unusually rapid over the past two decades, which has created an increasing demand for cement. It is not unreasonable to anticipate that further development of consuming markets will be in order and that the per capita consumption of cement will increase with the individual's purchasing power.

The history of the cement industry in Canada is very largely one that involves the subsidiary groups of the Canada Cement Co. The plants of this organization account for most of the total national output. It has grown to the point where it may be considered completely dominant except in British Columbia. The controlling interest is held by Canadian citizens.

Four other firms are operating in the industry at present.

The average annual mill price has advanced with each succeeding year since 1926, continuing in 1930.

The tabulation of the physical structure of the Canadian cement industry for 1925 and 1930 shows many interesting changes. It is for the most part self-explanatory, but it may be of value to point out that with greatly increased capital outlay, permitting greater capacity, unit operating costs (insofar as the table indicates) have decreased. While this is naturally in line with modern practice and consequently is to be expected,

Foreword

IN comparison with many other commodities, cement has not been of any great significance in American export trade. As interest in this subject is being increasingly manifested, the Bureau of Foreign and Domestic Commerce is to make an investigation of nearby market facilities which will be reported in a number of circulars. The information herein contained is the first of these reports and is issued as Special Circular No. 1 on Cement Markets of the Western Hemisphere, and deals with the Canadian market.

In general, it may be stated that on the basis of quality the cement of the United States meets no prejudice in competition with foreign brands, but it seems that price alone is the outstanding factor which must be met. However, while price reduction and consumption requirements have been drastically cut in practically every producing country of the world—preeminently Europe—price lowering in the United States during the past few months has been proportionately far greater than elsewhere. It would seem, then, that, with recent favoring changes in the freight rate on outgoing cargo to countries to the south, exporters of cement from the United States might reasonably be permitted by careful marketing to enjoy a greater share of the export trade than has heretofore been the case.

it is apparent that there is no constant ratio between the increasing capitalization and decreasing operating costs.

With an increase in production of nearly 50% during the 5-year period, the number of employees increased but 20% and the out-

put per man 24.5%. Theoretically, and assuming an expanding market, a point might be reached where the operating profit would range near 40%. However, sales costs and the necessity of keeping prices in general line with competitive possibilities, suggest that the past 5-year record may not be maintained.

The decline in selling value between 1925 and 1930 is noted as approximately 16%; that of apparent manufacturing profits (capital outlay per barrel considered from a 10-year base) in the same period shows a decline of approximately the same percentage, although that any such correlation is actually intended is questionable.

CANADIAN PRODUCTION AND SALES

| Year | Value of sales | Pct. increase in sales | Value per barrel Canadian | American |
|------|----------------|------------------------|---------------------------|----------|
| 1920 | \$14,798,070 | | \$2,224 | \$2,389 |
| 1921 | 14,195,143 | 13.5* | 2,467 | 2,651 |
| 1922 | 15,438,481 | plus 20.7 | 2,223 | 2,388 |
| 1923 | 15,064,661 | plus 8.6 | 1,997 | 2,145 |
| 1924 | 13,398,411 | .6* | 1,787 | 1,919 |
| 1925 | 14,046,704 | plus 18.2 | 1,731 | 1,859 |
| 1926 | 13,013,283 | plus 17.3 | 1,494 | 1,605 |
| 1927 | 14,391,937 | plus 18.9 | 1,430 | 1,536 |
| 1928 | 16,739,163 | plus 9.5 | 1,518 | 1,631 |
| 1929 | 19,337,235 | plus 11.4 | 1,574 | 1,691 |
| 1930 | 19,818,451 | 10.2* | 1,615 | ..... |

*Decrease.

CANADIAN PRODUCTION AND SALES

| Year | Production Canadian barrels* | Sales, barrels* | |
|------|------------------------------|-----------------|------------|
| | | Canadian | American |
| 1920 | ..... | 6,651,980 | 6,192,002 |
| 1921 | ..... | 5,752,885 | 5,355,079 |
| 1922 | ..... | 6,943,972 | 6,463,803 |
| 1923 | ..... | 7,543,589 | 7,021,957 |
| 1924 | ..... | 7,498,624 | 6,980,102 |
| 1925 | 7,869,946 | 8,116,597 | 7,555,342 |
| 1926 | 9,041,411 | 8,707,021 | 8,104,930 |
| 1927 | 9,927,163 | 10,065,865 | 9,369,810 |
| 1928 | 11,076,659 | 11,023,928 | 10,261,623 |
| 1929 | 12,252,203 | 12,284,081 | 11,434,637 |
| 1930 | 11,790,409 | 11,032,539 | 10,269,639 |

*Canadian barrel weighs 350 lb.; United States barrel, 376 lb.

Despite the fact that 1930 marked a general recession in Canadian business, sales of cement were actually higher than in 1928, although 1930 production exceeded that in the latter year by 713,750 bbl., the resulting excess being reflected in stocks. An interesting feature in the expansion of the industry has been a somewhat well-defined rate of annual increase, averaging 600,000 bbl. Until 1930 stocks on hand have been kept down in relatively close ratio to output, but during that year the seemingly anticipated utilization of cement in large public and private construction works was not realized, pos-

PHYSICAL CHANGES OCCURRING IN THE CANADIAN CEMENT INDUSTRY SINCE 1925

| | 1925 | 1930 | Increase | Pct. increase |
|----------------------------|--------------|--------------|--------------|---------------|
| Capital | \$38,081,583 | \$59,210,737 | \$21,129,154 | 55. |
| Output | 7,869,946† | 11,790,408 | 3,920,462 | 49.8 |
| Salaries and wages | 2,511,400 | 3,172,198 | 660,798 | 26.3 |
| Fuel and electricity | 2,848,904 | 4,120,367 | 1,271,463 | 44.6 |
| Selling value | 14,046,704 | 17,713,067 | 3,666,363 | 26.1 |
| Employees | 1,926 | 2,317 | 391 | 20.3 |
| Output per employee | 4,086.16† | 5,088.65 | 1,002.5 | 24.5 |
| Salary per employee | 1,303.95 | 1,369.09 | 65.14 | 5.0 |
| BARREL VALUES | | | | |
| Capital outlay | 4.839 | 5.02 | .183 | 3.8 |
| Labor cost | 0.319 | 0.27 | 0.050* | 16* |
| Fuel and electricity | 0.362 | 0.35 | 0.012* | 3.3* |
| Selling value | 1.785 | 1.50 | 0.283* | 15.9* |

*Decrease. †Barrels of 350 lb.

CANADIAN EXPORTS OF CEMENT

| | 1926 | | 1927 | | 1928 | | 1929 | | 1930 | |
|---------------------------------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| | Barrels | Value | Barrels | Value | Barrels | Value | Barrels | Value | Barrels | Value |
| United States | 76,538 | \$ 99,235 | 23,372 | \$ 46,880 | 35,303 | \$ 83,025 | 1,241 | \$ 3,532 | 3,266 | \$ 6,937 |
| Bermuda | 6,930 | 9,944 | 6,988 | 10,173 | 4,243 | 6,552 | 5,534 | 8,842 | 9,429 | 14,512 |
| British Guiana | 10,743 | 17,573 | 8,594 | 15,161 | 26,320 | 42,809 | 376 | 589 | | |
| Jamaica | 14,503 | 15,373 | 16,490 | 14,562 | 9,942 | 8,174 | 5,425 | 4,912 | 13,220 | 11,051 |
| Trinidad and Tob. | 15,631 | 17,343 | 11,173 | 13,571 | 12,286 | 14,212 | 15,161 | 18,450 | 11,629 | 13,473 |
| Other British West Indies | 8,448 | 9,620 | 12,665 | 17,755 | 19,049 | 24,376 | 19,251 | 23,663 | 7,777 | 8,805 |
| Newfoundland | 46,551 | 59,853 | 51,404 | 59,003 | 16,454 | 16,996 | 34,314 | 33,695 | 39,378 | 45,171 |
| Colombia | 16,082 | 19,259 | 33,167 | 36,738 | 73,371 | 72,250 | 72,441 | 77,466 | 24,916 | 24,302 |
| French West Indies | | | | | 11,119 | 10,384 | 19,606 | 16,835 | 15,912 | 13,697 |
| St. Pierre and Miquette | | | | | 6,437 | 10,407 | 3,011 | 5,006 | 5,968 | 7,733 |
| Mexico | | | | | 16,236 | 15,695 | 1,397 | 1,338 | | |
| Panama | | | | | 3,561 | 3,493 | 13,263 | 13,358 | 4,671 | 4,649 |
| Peru | 19,377 | 25,908 | 18,265 | 19,406 | 15,707 | 15,178 | 15,199 | 16,378 | 15,962 | 15,671 |
| Honduras | 10,175 | 14,360 | 6,883 | 7,537 | | | | | 26,649 | 26,071 |
| British South Africa | 9,776 | 11,487 | 6,338 | 7,690 | | | | | | |
| Brazil | 24,171 | 25,009 | 23,634 | 24,265 | | | | | | |
| Other countries | 27,047 | 33,267 | 30,721 | 35,403 | 17,297 | 17,073 | 27,892 | 28,891 | 19,960 | 19,999 |
| Total | 285,932 | \$358,231 | 249,694 | \$308,144 | 267,325 | \$340,624 | 234,111 | \$252,955 | 198,737 | \$212,071 |

sibly accounting for the curtailment of production.

Imports of cement into Canada have never been of great significance, comprising almost entirely cements of special manufactures and uses. In 1929 a total of 52,109 bbl. was received, invoiced at \$189,169, or an average of \$3.63 per bbl. This average value is higher by about \$2 than the average Canadian f.o.b. mill price during the same year.

The trend of Canadian exports has been downward for the last five years. The high point of shipments was reached in 1926 with 285,932 bbl. (350 lb.) valued at \$358,231. This quantity represents roughly 3% of production in that year.

It is notable that the larger part of exports is consigned to British possessions, where such duties as may exist are decidedly favorable to the Canadian exporter. Canadian cement is manufactured under much the same conditions as in the United States, and consequently, like the American product, competes at a disadvantage in foreign markets. In this connection it may be noted that a rather high percentage of United States cement shipped to countries of Latin America is made up of special brands not strictly in the same price class as gray portland cement.

Detailed receipts for 1930 are not available but since 1925 the United Kingdom has not been reported as a source of imported cements. The United States is the outstanding shipper of the limited quantities involved.

The Canadian tariff (not applying in Newfoundland) provides for a duty of \$0.08 per hundred upon imports from the United States on "cement, portland and hydraulic or water lime, in bags, barrels, or casks, the weight of the package to be included in the weight for duty." This compares with the United States tariff on foreign cements of \$0.06 per 100 lb., including the weight of containers on "roman, portland and other hydraulic cements or cement clinker," with white nonstaining portland cement at \$0.08 per 100 lb., also including the weight of the container. Cement imported into Canada is further subject to a sales tax on the duty

paid value unless imported by a licensed jobber or wholesaler for resale.

Newfoundland

The manufacture of cement has not as yet been undertaken in Newfoundland, nor are there indications that the demand justifies the erection of even a small plant.

With the exception of the larger business houses in St. John's constructed mostly of brick and stone, together with several large industrial and public buildings, utilization of cement is confined to concrete foundations, highway and railroad bridges, and occasionally dam construction.

The Newfoundland customs in compiling import statistics on cement prepares values without reference to applying quantities. The valuation of imports was \$32,292 in 1927, \$45,167 in 1928, and \$18,780 in 1929. Naturally enough the principal source is Canada. The United Kingdom and the United States furnish occasional supplies and significant quantities come from certain of the Northern European countries.

Wholesale and retail prices as of December 20, 1930, together with other incidental charges are here noted. It is obvious that the high cost of cement to the ultimate consumer hardly favors its wide use.

| | Per barrel Wholesale | 375 lb. net Retail |
|-------------------------------|-------------------------|-----------------------|
| Canada cement— | | |
| Montreal, Canada | \$3.50 | \$3.60 |
| Dalen portland cement— | | |
| Norway | 3.10 | 3.40 |
| Norden portland cement— | | |
| Allborg, Norway | 3.30 | 3.60 |
| Portland cement— | | |
| Belesmore Port, England | 3.30 | 3.85 |

The cost of Canadian cement to the importer as of the above date was \$2 per bbl. f. o. b. Montreal, and that of Norwegian cement \$1.38 per bbl. f.o.b. port, Norway.

The Newfoundland customs tariff provides for an ad valorem duty of 35% on "portland, roman and hydraulic, water lime and iron oxide, fiber and flooring cement." In addition to this duty a 5% sales tax is added to the invoice price of all imports.

Receipts of cement are handled either at

the docks owned by importers at St. John's or by means of lighters from ocean-going steamers. In the former case the cost of handling approximates \$0.12 and in the latter case \$0.24 per bbl.

At the beginning of the current year the freight rate on cement in barrels of 375 lb. at St. John's was \$0.70 from Montreal, \$0.65 from Norway, \$0.60 United Kingdom, and \$0.66 from the United States (Boston). Calculating, as an example, the unit profit to the importer on the sale of cement from Allborg, Norway, and using the above costs totaling \$2.82, a firm having to lighter cement from ship to dock would probably realize something less than \$0.78 per bbl. on a retail sale. Judging from present day profits, this amount is thought to be fairly reasonable, but total returns are limited by actual demand. The climate of Newfoundland is extremely damp and requires that wooden barrels or casks be employed for all shipments. The empty containers themselves have some demand and bring about \$0.15 each.

While no government regulations require labeling of foreign cement, it is stated by Consul George C. Cobb of St. John's that the word "cement" should be plainly marked on the outside of the container in order that general precautions may be taken to protect it from dampness.

Deposits of limestone are at present being worked at Aguathuna on the western coast of the island for use as a flux by the Dominion Iron Steel Co. About four miles from the mouth of Humber river is located another deposit supplying a British paper mill at Grand Falls. Other available raw materials thought to be suitable for cement manufacture are gypsum at two deposits on the western coast and clay found near Random, Trinity Bay, on the eastern coast. State construction work, confined principally to bridges, foundations and footings for minor structures, has been considerably augmented during recent months, principally to aid unemployment in the colony. However, no definite program exists and the work is carried on as available funds permit.

Nova Scotia—Maritime Provinces

The demand for cement in the Maritime Provinces has increased notably in the past few years, primarily due to generally active building construction programs, and it is anticipated that future requirements, while perhaps not increasing, will be maintained at the present annual rate of about 300,000 bbl. A number of construction projects chiefly in connection with port works at Halifax, Nova Scotia, and St. John, New Brunswick, will necessitate the consumption of moderate quantities of cement in 1931, these two Provinces consuming the largest portion of receipts since Prince Edward Island is predominantly agricultural.

While there is no production in this region and supplies are brought from plants in other Provinces, it is reported that a company has been organized in New Brunswick during the course of recent months, receiving a charter under the name of the Maritime Cement Co. It has an authorized capital of \$1,000,000, and is controlled by a Canadian group which also controls considerable deposits of raw material necessary for production. By way of history it is further reported that the Canada Cement Co. prepared plans two years ago for the construction of wharfage facilities and warehouses at St. John, New Brunswick. It was then estimated that a plant having a production capacity of close to a million barrels would be necessary to operate efficiently, whereas actually market demand ranged around 100,000 bbl. These plans were never brought to fulfillment and may have been influenced by the formation of the Maritime Cement Co. Unlike Newfoundland, and in spite of the wet climate, cement is delivered in paper bags of 87½ lb. Wholesale prices at Halifax on the first of the current year approximated \$2.31 per bbl. (350 lb.) f.o.b. car in carload lots and the cement retailed for \$2.80 per bbl. This compares with prices of \$2.66 and \$3.20, respectively, in the corresponding period of 1929.

At St. John, New Brunswick, on December 18, 1930, the wholesale price was \$2.50 per bbl. and retail price \$3.10. Broadly, these values are \$0.40 more than for the same cement, under the same economic conditions, in the summer. During the summer months a competitive rail rate is said to be in force in order to meet cheap water transportation. Navigation closes about December 1 and does not open until late in April, depending on the severity of the winter.

Wholesale quantities of cement are obtained by dealers direct from Montreal factories in large lots, as is the general custom in the United States. One producer's distributing organization is reported to have established cement storehouses at Halifax and St. John in 1929, and is controlled by the Canada Cement Co. of Montreal. It is understood that this organization has a maximum storage capacity of 30,000 bbl. in bulk, brought in especially constructed boats, but

distribution is confined to a very limited area.

Distribution in St. John is effected by the firm of Gandy and Allison specializing in builders' supplies and acting as wholesale and retail agents. Adequate supplies of cement-making raw materials are available. Cement consumption and probable future demand, however, are hardly expected to warrant their development for cement manufacturing purposes.

Nova Scotia, New Brunswick, and Newfoundland, because of nonproduction would appear to be the most logical points of penetration for foreign cement, but as the presence of many factors intended to protect Canadian cement manufacturers, collectively, would seem to preclude American participation in the domestic markets, other than a general discussion has not been attempted. Aside from normal protective customs imports, sales taxes, freight charges, registration fees on foreigners' sales offices and certain kinds of sales personnel, the Canadian industry is so organized as to production costs and distribution systems that, excepting special brands not manufactured in Canada, the sale of United States portland cement generally can not be effected in these or other areas.

Ontario

Ontario with its sister Province Quebec lies in probably the most favored Canadian environment, and its cement plants contributed over 37% of Canada's record output in 1929. While the northwestern portion, aside from mining developments, is relatively unimportant, the areas bordering on Lakes Superior and Ontario enjoy much the same conditions as the states of New York and Ohio. Further, the greatest population concentration of Canada is here and its 3,251,000 or more people represent one-third of the Dominion total. The Canada Cement Co. maintains its major production in eastern Ontario, and it has two plants located at Belleville and one each at Port Colborne and Lakefield. Of the four plants, two are in continuous operation at present. A fifth plant is operated by the St. Mary's Cement Co., Ltd., of St. Mary's, a private company with controlling interest held by the officers of the Elias Rogers Co., Ltd., of Toronto. Neither company controls the other; they are separate organizations in spite of the fact that the same individuals hold controlling interests in both.

The company produces portland cement exclusively, using the wet process and coal imported from the United States. There seems to be no intention to extend operations to include any other type of product.

The sales territory of the St. Mary's consists of the Ontario Province generally; it is believed that this company and the three plants of the Canada Cement Co. manufacture the bulk of the cement sold in Ontario. The local trade has no particular prejudice against imported cement, but the price of the

domestic output is almost always sufficiently lower than prices on imports to insure sale. Each company maintains its own sales organization and no agreements as to production, territories or prices are known to exist, but quotations from the different manufacturers are practically identical at all times. On January 27, 1931, portland cement was quoted at \$2.52 a bbl. wholesale and \$3.25 retail, and a price of \$11.50 was given for quicksetting imported cement. Prices are regularly quoted on barrels of 350 lb. each, although practically all cement is sold and delivered in paper bags of 87½ lb. When cotton bags are used, a refund of 20 c. per bag is usually allowed. Prices are subject to a discount of \$0.10 per bbl. for cash in 20 days. Retail prices obtain on quantities of 5 bbl. or less, and wholesale prices on larger quantities. Prices still lower might be obtained on orders running into several carloads.

Imports are small and consist almost exclusively of quicksetting or other special kinds of cement not produced locally. Practically none finds its way far inland.

The use of cement in Ontario is practically identical with that in the northeastern part of the United States. No unusual construction projects were contemplated in early 1931; 1930 construction showed some decline from 1929 figures and it is not expected that 1931 will increase greatly, but a fair amount of building is expected.

The Canada Cement Co., Port Colborne, Ontario, as a result of being granted a fixed annual assessment of \$10,000 for 25 years, has announced that construction of the new \$500,000 plant would start in May. It will be built adjoining the present plant, which will continue in operation during construction, and will be equipped with the wet process of manufacture, eliminating the dust problem which has been the one great objection to the industry.

Quebec

The cities of Montreal and Quebec, the former the largest in the Dominion, have shown a remarkable growth in the past 20 years, and seem to promise a considerable future consumption of cement, which is now supplied almost exclusively by the Canada Cement Co. plants, three of which are located in this Province—two in Montreal East, and one at Hull.

All of the output of this company is portland cement manufactured by the wet process. The market for cement is sufficiently well concentrated to eliminate practically all competition from Canadian companies which might normally be expected. Distribution is effected by direct sales to large consumers and construction projects, shipment being made by railroad or water, according to season. It is reported that estimated consumption of portland cement for 1931 will probably show a slight increase over 1930, insofar as the Province of Quebec is concerned, although residential and office

building construction will be very greatly reduced. Certain construction projects being carried forward will require large quantities.

Prairie Provinces

In spite of their great area, consumption and production of cement in the Prairie Provinces are confined to the lower third of Alberta and the southern quarters of Saskatchewan and Manitoba. Of the six plants situated in this area two are located in Winnipeg and four in Alberta. Of these but three operate during the spring, summer, and autumn. Since the wet process of manufacture is used exclusively, there is no winter operation. Two of the Canada Cement Co. plants are considered as regularly operating, one at Fort Whyte and another at Exshaw, Alberta. The third, an independent operator, is located at Marlboro in the Peace River district of Alberta. The plant is owned by the A. MacDonald Co. at Winnipeg. Of the plants which have remained consistently idle, two are owned by the Canada Cement Co., and are located at Calgary and Blairmore, Alberta, respectively. The third plant is located at Winnipeg and is known as the Commercial Cement Co. Only portland cement is produced in the Prairie region. The Canada Cement Co.'s plant at Exshaw uses calcium chloride to shorten the time of set and permit use at freezing temperatures. Unit of weight is 87½ lb. paper bag, although cloth bags are supplied on request. From the Winnipeg plant of the Canada Cement Co., cement is shipped as far east as Port Arthur and Port William. The freight rate between Winnipeg and the lake head has recently been equalized with the rate to Montreal for these two cities. With a single operation at Winnipeg and with imports negligible, Winnipeg represents the center of distribution to Saskatchewan. Plants at Exshaw and Marlboro penetrate to central Saskatchewan and eastern British Columbia. According to a report from Trade Commissioner John A. Embry at Winnipeg, a need has long been felt for the establishment of a cement plant at or in the vicinity of a lake head city of Ontario. The construction of grain elevators and harbor improvements has consistently required large quantities of cement, probably averaging around 200,000 bbl. annually. Since, as noted, requirements must be met either from Winnipeg or Montreal with the attendant relative high freight costs, the price per barrel of cement at the lake ports of Port William and Port Arthur is about \$1.20 more than the quoted mill price at Montreal. The freight rate on coal from Lake Erie ports to Port Arthur is \$0.35 a ton, and it is argued that with the development of known deposits of limestone and shale a well chosen plant location would be economically justified. Cement plants in this district as well as throughout practically the entire Dominion sell only to jobbers and wholesalers. The wholesale price, f. o. b. Winnipeg, on February 14, 1931, was \$2.61, with an extra charge of

\$0.15 to pay for bag, bringing this quotation to \$3.21. No allowance is made for return of containers, although used cloth bags in good condition in a few cases bring \$0.20. An 87½-lb. paper bag retails for \$1. It is believed that the demand for cement in the Prairie Provinces will increase with the construction of hydroelectric development at Seven Sisters Falls and Slave Falls on Winnipeg river. In addition a number of grain elevators are to be located at various points throughout the region among them Churchill, Manitoba, Port Arthur, and Port William, Ontario.

British Columbia

Cement production in British Columbia, as reported by the Provincial Bureau of Mines, was 523,931 bbl. valued at \$1,182,552 in 1927; 670,796 bbl. valued at \$1,495,204 in 1928; 680,903 bbl. valued at \$1,487,223 in 1929; and 721,045 bbl. valued at \$1,489,233 in 1930.

Of the three cement plants supplying the western section of British Columbia, one carries the manufacture from raw material to finished products; one is idle, deposits of limestone having been worked out; and the third, which is very small, is used to grind clinker imported from abroad, principally from Europe, although receipts of Japanese clinker have been indicated. The British Columbia Cement Co., Ltd., of Victoria, owning the first two plants mentioned, is reported to be about equally divided between Canadian and English capital. The regularly producing plant is located at Bamber-ton on the west side of Saanich in Vancouver Island, and is reached by highway. The second of this company's plants is located at Tod Inlet, also on the Saanich peninsula. The clinker grinding plant is operated by the Coast Cement Co. at Granville Island, situated in Force Creek in the heart of Vancouver. The company is said to be completely owned by Canadian capital. It is reported that the production of the Coast Cement Co. is small, and that the two plants are capable of producing about 1,500,000 bbl. (350 lb.) annually. The 1929 production of the latter company was about 700,000 bbl., but figures for 1930 are not available.

These plants use the wet process. The British Columbia company uses local coal in a pulverized form, the annual consumption being reported at about 40,000 tons. Plant equipment is reported to be practically all of English origin, but the weighing machinery is said to be of American manufacture or else produced in subsidiary plants in Canada. Sacking machinery is also used, but particulars as to their manufacture are not available. The usual cement containers are wood barrels, paper-lined, or jute sacks containing 87½ lb. Distribution is usually by sack, and the customary allowance of \$0.20 is made for their return in good condition. Paper sacks are not in general use, although an attempt has been made to introduce them.

No further plants are contemplated, so far as is known.

Sales are largely in or near Vancouver and Victoria, which contain more than half the population of British Columbia. Sales territories include the coast of the mainland, with the largest market at Prince Rupert, and the interior sections of the Province as far east as the Okanagan district, beyond which freight rates operate against shipping.

There is no distributing organization of producers, nor any evidence to indicate the existence of agreements between them on sales, which are generally made through agents. The largest distributor states that there are practically no imports into this area, with the exception of small quantities of white cement from the United States. Imports are required to have the country of origin shown on the containers. Handling charges at Vancouver wharves are \$0.65 a short ton, or 40 cu. ft.

On January 31, 1931, domestic portland cement was sold wholesale at \$2.60 a bbl. of 350 lb. f.o.b. Vancouver, plus sales tax. The retail price of portland cement on the same date was 20 or 25% over the wholesale price, or \$3.12 to \$3.25 per bbl. These prices cover the average sales; on a recent contract of considerable proportions the successful bid was \$2.72 a bbl.

As in the case in the Provinces to the east, building construction of a neutral type has slackened off considerably in recent months. However, public construction work has been given an increasing impetus during that same time through the medium of several major projects, including the Canadian Pacific railroad tunnel and the Burrard St. bridge. Grain elevators, highway construction and the possibility of at least one other tunnel should be of considerable assistance in consuming cement in the near future. Excepting the exhaustion of the limestone deposits at the Bamber-ton plant, it appears that supplies of raw materials are abundant.

Canadian Production of Talc and Soapstone in 1930

THE PRODUCTION of talc and soapstone in Canada during 1930 was valued at \$186,216 as compared with a value of \$229,198 in 1929, according to finally revised statistics just issued by the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics at Ottawa.

The Quebec production consisted of soapstone blocks and powder shipped from a quarry in Broughton township. Ontario operators, near Madoc, Hastings county, shipped 11,664 tons of talc during the year, while in British Columbia small shipments of talc were made from properties at Anderson Lake and Lechtown.

Talc and soapstone, ground or unground, imported into Canada during 1930 amounted to 4799 tons worth \$85,779. Exports of talc totaled 8512 tons, appraised at \$98,855.

Stone Convention at Pittsburgh, January 19-22, 1932

Directors of the National Crushed Stone Association Hold
Semi-Annual Meeting at Atlantic City, July 24 and 25

THE SEMI-ANNUAL MEETING of the board of directors of the National Crushed Stone Association, at Atlantic City, N. J., July 24, voted to hold the next annual convention of the industry at the William Penn Hotel, Pittsburgh, Penn., beginning Tuesday, January 19, and lasting four days, to January 22, 1932. This is the week prior to the annual convention of the National Sand and Gravel Association, at the same hotel. It is probable that the annual convention of the National Ready-Mixed Concrete Association will be held at the same hotel at about the same time. So again, as was the case this year, the conventions are timed and placed for the greatest convenience of those members interested in both or all three industries; both producers and equipment manufacturers.

In addition to the usual reports on the financial condition and prospects of the association, there were reports of the various standing committees, which are of interest to the entire industry. Perhaps the most important action of the board was the adoption of a resolution directing the executive committee to draw a line between research work of such general interest and value as to be properly chargeable to the association treasury, and such laboratory work for individual members as was more properly a charge against them as individuals. Because of the limitations on the work of the laboratory and the increasing demands for both fundamental research and for individual company servicing, this step was deemed advisable. It seems that some of the member companies have in the past voluntarily paid a part of the expenses of the engineering director of the association when on field work of a character to particularly benefit them.

Report of the Director of Engineering

Following is an abstract of the report of A. T. Goldbeck, director of the bureau of engineering of the association:

The activities of the Bureau of Engineering during the first six months of 1931 have been of a varied nature which in the present report will be treated only in summary form under the following heads:

1. Publishing articles of benefit to the crushed stone industry.

2. Acting for individual producers, or local groups of producers in connection with technical matters pertaining to the use of crushed stone.



Albert L. Worthen, president of
N. C. S. A.

3. Representing the industry on technical committees.

4. General correspondence.

5. Presentation of papers or discussions before technical organizations.

6. Laboratory research.

A number of articles have been published in the *Crushed Stone Journal* and in addition a weekly article has been issued to the members of the Association under the heading of "Useful Information." The following articles have appeared in the *Crushed Stone Journal*:

1. Report of the Director of the Bureau of Engineering to the Research Committee.

2. The Expansion and Contraction of Concrete.

3. Freezing Tests on Mortar and Concrete.

4. The Proportioning of Concrete for Strength, Durability and Impermeability.

Articles have also been published in our Useful Information service under the following heads:

1. Specific Gravity.

2. Solid Volume and Voids.

3. Fundamental Conceptions of Concrete.
4. Allowable Quantities of Mixing Water for Concrete under Different Exposure Conditions.

5. How to Compute the Volume of Concrete Produced by Given Quantities of Materials.

6. The "Stage" Method of Highway Construction.

7. The Crushed Stone Traffic Bound Road.

8. Specifications for Crushed Stone Traffic Bound Roads.

9. Segregation.

10. The Determination of the Size of Stone.

During the first six months of 1931 contact was made with the following states or city departments in connection with matters pertaining to specifications or other aggregate problems: New York, Michigan, Indiana, Illinois, Tennessee, New Jersey, City of Washington, City of Chicago, Bureau of Public Roads, Supervising Architect's Office, Washington, D. C.

The questions involved included the following subjects:

1. Discussion of the proper method of making and interpreting the sodium sulphate test for the soundness of fine aggregate and of stone.

2. The suitability of stone from different portions of a quarry which was under suspicion for unsoundness.

3. Slag competition.

4. To discuss the economy in the use of crushed stone as against other aggregates for particular purposes.

5. To discuss the effect of coarse aggregate on the stability of bituminous concrete.

6. Stone sand.

7. Proper specifications for concrete proportioning.

8. To determine the status of specifications proposed for use in federal aid highway construction.

9. Specifications for post office construction.

The director of the bureau of engineering is a member of the following technical committees, most of them of importance to the crushed stone industry:

Committee C-9, on Concrete and Concrete Aggregates.

Committee D-4, on Road Materials.

Committee E-1, on Methods of Tests.

Committee C-1, on portland cement (recently resigned).

Committee on Unit Masonry. Recently elected to membership on this committee. Membership was accepted because of the use of crushed stone in such construction.

All of the above are committees of the American Society for Testing Materials.

Committee 201, on Concrete Aggregates of the American Concrete Institute.

Committee on Nonmetallic Minerals of the American Institute of Mining and Metallurgical Engineers.

Committee on Design of the Highway Research Board.

Committee on Mineral Aggregates of the Highway Research Board.

National County Road Planning Commission.

Committee on Subgrades of the American Road Builders' Association.

Association of Asphalt Paving Technologists.

Committee on Ballast of the American Railway Engineering Association.

Joint Committee on Concrete and Reinforced Concrete, composed of representatives from a number of technical organizations.

Joint Technical Committee of Mineral Aggregates Associations.

Papers were presented before the American Road Builders' Association, the National Ready-Mixed Concrete Association, the National Paving Brick Association and a discussion was also presented before the American Society for Testing Materials.

The paper before the A. R. B. A. had to do with the Landing Impact of Airplanes; that before the Ready-Mixed Concrete Association was entitled "The Proportioning of Concrete for Strength, Durability and Impermeability," while "Foundations for Brick Pavements" was the subject discussed before the annual meeting of the Brick Association. The discussion before the A. S. T. M. was in connection with a paper presented by F. H. Jackson of the Bureau of Public Roads on concrete investigations.

As has already been pointed out, in a previous report, Mr. Goldbeck said, the greatest benefit of the work of the bureau to the members of the association is derived from that portion of the work which is of a basic nature. For it is this sort of work which benefits the industry as a whole. The study of fundamental problems in the laboratory, such as the stability of bituminous materials and the development of a proper soundness test, the development of a method for beam testing and the design of concrete having a given beam strength, the publication of technical information, the development of a size standard, are all projects having general application. It would be highly desirable if the laboratory could engage on such projects almost exclusively, but it is recognized that individual problems of producers should also be solved. The laboratory and its director are making an effort to properly take care of the individual problems as well as those of general application, Mr. Goldbeck said.

In his report to the chairman of the research advisory committee of the association, Mr. Goldbeck said that the adoption of a soundness test that would be really helpful in the determination of causes of unsoundness in concrete was one of the most important problems facing the crushed stone industry. Another work of importance is that on the use of stone sand as fine aggregate in concrete. On this subject Mr. Goldbeck said:

"A great deal of interest is being taken by a number of producers in the use of stone sand as a fine aggregate in concrete and

consequently we thought it advisable to engage in a series of laboratory tests to determine the best gradation and other properties of this material. We are undertaking this work at the present time by making the so-called mortar-voids test in a systematic series of gradations. This work is very tedious and time-consuming but this method of attack seems to be revealing the mortar-making quality of the stone sand and this is an indication of its concrete making properties. When this investigation is completed, we hope to be able to show the effect of gradation on the strength and economy of concrete made with various gradations of stone sand and we should thus obtain information which will enable us to make definite recommendations regarding specification limits."

For the first time perhaps in any laboratory, the National Crushed Stone Association is studying comprehensively the effect of size gradation on the stability of railway ballast. On this subject Mr. Goldbeck said:

"During the past several months the greater part of the time of the laboratory force has been spent in making tests on the stability of railroad ballast. The apparatus for making this test was designed and built in the laboratory. It then became necessary to make a long and elaborate series of tests to standardize the test procedure so that results might be duplicated. After many trials we have succeeded in devising a test procedure which enables us to duplicate our tests within a reasonable limit of accuracy. Other investigators working toward the same end have reported their failure to obtain check results.

"The stability tests consist of a procedure for determining the bearing value of a layer of ballast which is confined in a bin 6 ft. square, the layer being 1½ ft. in thickness. Load is applied to this layer by means of a hydraulic jack through a bearing block 10 in. square. Simultaneous readings of load and indentation of the bearing block are taken. The present indications are that crushed stone graded from 2½ in. uniformly down to the No. 4 sieve gives the highest stability, higher than the gradation now specified by the American Railway Engineering Association, namely 2¾ to ¾ in. Apparently, the addition of the small size material helps out the stability and makes for more uniform support. At the present time preparations are under way to make similar tests on gravel ballast and this will finally be followed up with similar tests on slag ballast. It is recognized that stability tests alone are not sufficient to determine the gradation for there are other items to be considered, for instance, the matter of drainage."

The research advisory committee of the association has been reorganized with 16 subcommittees, each to handle specific problems.

Freight Rate Issue

W. R. Sanborn, Lehigh Stone Co., Kanakee, Ill., chairman of the transportation committee of the board, reported at length

on an attempt to determine the attitude of the crushed stone industry toward the railways' petition for a 15% increase in freight rates. Of course, there were many diverse opinions. The questionnaires did prove, however, that the railways had been and still are, under present rates, steadily losing crushed stone traffic to motor trucks. Consequently, there was practically a unanimous opinion that a 15% increase in crushed stone rates would result in a further loss of this business to the railways, and consequently a loss of revenue. It was also very generally believed that an increase in freight rates would encourage the construction of more local plants, doing a trucking business exclusively.

Doubt Increased Revenue Would Result

The matter of action by the association was left, by resolution of the board, in the hands of the president and the chairman of the transportation committee, W. R. Sanborn, with power to employ counsel in the presentation of the case before the Interstate Commerce Commission. The resolution made it clear that the crushed stone industry did not oppose the increase, but merely doubted if it would prove effective, so far as crushed stone rates were concerned, in increasing the railway's earnings. It also made clear that the crushed stone industry should be accorded the same treatment in the matter of rates, as might be decided in regard to rates on competitive materials.

Cost Accounting

William E. Hilliard, New Haven Trap Rock Co., New Haven, Conn., reporting as chairman of the committee on uniform cost accounting, said that preparations had already been made for the secretary to have published a cost accounting manual for distribution to members. The system of cost accounting proposed is so flexible as to serve for any size of operation. It consists of four essentials only: (1) Quarry; (2) Plant; (3) Storage; (4) Delivery (shipping). A small operation need go no farther in the subdivision of its costs, for comparative purposes. However, to intelligently arrive at these four fundamentals of cost the following subdivisions are really necessary:

QUARRY

- Stripping
- Drilling
- Blasting
- Loading
- Hauling
- Miscellaneous
- Depletion

PLANT

- Crushing
- Screening
- Conveying

STORAGE

- Into
- Out of

DELIVERY (shipping)

The above outline of costs may be farther developed, where the operator desires, by



Crushed stone directors and some of the guests at Atlantic City

subdividing each of the quarry cost items, Stripping; Drilling; Blasting; etc., into.

- Operating labor
- Operating material
- Repair labor
- Repair material
- Power
- Sundry expense
- Overhead
- Charges from reserves
- Special charges
- Depletion

Similar subdivisions are made for the other three main heads: Crushing, Screening and Conveying; Storage, and Delivery.

It is proposed to report summaries of manufacturing cost to the association for the general information of its members.

Trade Practice Rules

Because the files of ROCK PRODUCTS contain quite an extensive history of the inception, development and adoption of the trade practice rules of the crushed stone industry, it is perhaps only fair to devote space here to the entire report of the committee under the chairmanship of Otho M. Graves, president, General Crushed Stone Co., Easton, Penn., which brings this history to date. As in the case of other industries, the crushed stone industry is far from satisfied with recent developments. Mr. Graves said:

"Under date of May 29 we were informed by the secretary of the Federal Trade Commission that the commission had reconsidered its action on rules of the crushed stone industry adopted by the industry at a Trade Practice Conference held in Cincinnati, Ohio, on the 23rd day of January, 1930. We were further informed that to the extent that the industry approved and adopted the rules as modified by the commission, that upon notice thereof, the commission would consider them as rules of the industry and that if the commission was not informed of such approval and adoption by the industry of the modified

rules within 60 days from May 29, it would withdraw its approval and acceptance of each and all rules for the industry.

"The committee, through its chairman, replied under date of June 3, pointing out that a Trade Practice Conference for the industry could not feasibly be called and held within 60 days and asking if the commission construed that the Trade Practice Committee, as created under Rule B, Group II, has the authority to accept the modifications required by the Commission thereby binding the industry to their acceptance. A copy of this correspondence was sent to President Worthen. The reply, dated June 11, from the commission stated that the final action upon trade practice conference rules was sent only to committees of the industries and not to individual members of the industry. It was the intention of the commission that the committees either act for the industries within the 60-day period mentioned in the letter of May 29, or notify the individual members of the industry. The method to be adopted by the committee in ascertaining the views of the industry is for the committees and not the commission to determine, the committees being at liberty to choose their own method.' It was also stated, by the secretary, that the commission would not authorize another Trade Practice Conference for consideration of the changes set forth in its letter of May 29. It therefore appeared to the chairman of the committee and to the president of our association that the commission regarded the committee as having authority to act for the industry though the commission would not choose the method to be followed.

"It did not seem wise or feasible to endeavor to secure a mail vote from each member of the industry as to its viewpoint regarding the modifications. Consequently a copy of the first letter received from Mr. Johnson, as well as the original and modified

rules, were sent to each member of the Trade Practice Committee asking that each member vote as to whether or not the committee should act for the industry. The replies from the members of the committee authorized the chairman to notify the secretary that the modifications were approved by the committee on behalf of the industry with the exception of one member who expressed doubt as to the authority of the committee to act for the industry and therefore deemed it prudent to refrain from voting. By virtue of the vote of the committee the chairman, under date of July 9, notified the secretary of the commission that: 'By majority vote of the members of the Trade Practice Committee of the industry, I am authorized to inform you that on behalf of the industry the committee accepts the rules as modified by the commission which we submitted with your letter of May 29.' The commission has replied by letter of July 13 to the effect that the commission now regards the rules as modified as those of the industry, and that in due course 'a statement of the rules as changed will be sent by the commission to each member of the industry for the information of each individual.' The original rules as adopted at the Cincinnati Trade Practice Conference in January, 1930, and as subsequently approved by the commission in April, 1930, as well as the form in which they are now modified, are submitted at the conclusion of this report. The committee holds that the modifications do not materially affect the spirit and intent of the original rules.

"The purpose of the commission in modifying the rules is apparently twofold: first, to effect standardization throughout all the industries which have adopted trade practice rules and secondly, to further prevent any possible conflict with the Department of Justice by approving rules which in form might be questionable. There has been wide-

spread criticism of the commission to the general effect that its attitude is constantly weak and continually vacillating. The chairman of your committee is a member of the standing committee, congress of industries, which has endeavored to prevent a further weakening of the rules adopted by various industries; in this endeavor it does not seem to have been particularly successful. Nor has the action of the commission in further modifying substantially all trade practice rules met with unanimous approval within the membership of the commission. Commissioner Humphrey issued a broadcast criticizing the action of the commission and setting forth his personal opinion which summarized is as follows:

"1. He favored changing some rules in Group 1, so as to make the rules conform with the law but opposed any change in the language as adopted by the industry, except in so far as it was necessary to accomplish this purpose.

"2. He opposed changes in Group II Rules.

"3. He opposed the 'standardization' of the rules and protested against such change in each industry. He believed that such 'standardization' was not justified and did great injury to the industries concerned.

"4. He believes that 'standardization' was the cause of the evils that grew out of the revision.

"One of the members of your committee has suggested that the industry adopt its own rules without regard to the Federal Trade Commission; set up the necessary machinery for their enforcement and levy fines for their violation. The danger of such a procedure would be that rules might be adopted which the Department of Justice would hold to be contrary to the law, rendering us liable to prosecution. The advantage of a trade practice conference lay in that rules that were adopted were by and with the advice and counsel of the Federal Trade Commission which would stand between an industry and the Department of Justice. It may be that the apparently vacillating and weak policy of the commission is really based upon its fear that it may lead an industry into conflict with the Department of Justice and that to prevent such an unfortunate contingency it uses extreme care and caution thereby giving the impression that it 'draws the teeth' from trade practice rules and weakens them unnecessarily. The chairman of your committee is inclined to think that until the status of the Federal Trade Commission is more definitely defined by Federal statute the members of the commission will be reluctant and hesitant to take any firm stand such as is really required by industries seeking to purge themselves of economic and industrial evils.

"In conclusion, your committee is of the opinion that under Rule B, Group II, it has authority to accept on behalf of the industry the rules as modified by the commission; that such acceptance is desirable in order

that we retain approval of our rules by the commission; and that the commission is not likely to pursue a firmer and more vigorous policy in view of the uncertainty of action by the Department of Justice and the obligation which the commission feels to fully protect each industry whose rules it approves."

Modified Trade Practice Rules

Rule 1. The Commission substituted and approved the following for Rule 1, as published April 15, 1930:

"Maliciously inducing or attempting to induce the breach of existing contracts between competitors and their customers by any false or deceptive means whatsoever, or interfering with or obstructing the performance of any such contractual duties or services by any such means, with the purpose and effect of unduly hampering, injuring, or embarrassing competitors in their business, is an unfair trade practice."

Rule 1, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The willful interference by any person, firm, corporation or association, with any existing contract between a seller and a purchaser, in or about the production, manufacture, transportation, purchase or sale of any product handled by the industry, or the performance of any contractual duty or service connected therewith, such interference being for the purpose or with the effect of dissipating, destroying or appropriating, in whole or in part, the patronage, property or business of another engaged in such industry, is an unfair trade practice."

Rule 2. The Commission approved Rule 2, as published April 15, 1930, which reads as follows:

"The false marking or branding of products of the industry with the effect of misleading or deceiving purchasers with respect to the quantity, quality, size, grade or substance of the materials purchased, is an unfair trade practice."

Rule 3. The Commission substituted and approved the following for Rule 3, as published April 15, 1930:

"The sale or offering for sale of any product of the industry by any false means or device which has the tendency and capacity to mislead or deceive customers or prospective customers as to the quantity, quality, substance or size of such product is an unfair trade practice."

Rule 3, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The sale or offering for sale of any product of the industry accompanied by misrepresentations calculated to deceive customers or prospective customers as to the quantity, quality, size, grade or substance of such product, is an unfair trade practice."

Rule 4. The Commission substituted and approved the following for Rule 4, as published April 15, 1930:

"The secret payment or allowance of rebates, refunds, commissions, or unearned discounts, whether in the form of money or otherwise, or secretly extending to certain purchasers special services or privileges, not extended to all purchasers under like terms and conditions, with the intent and with the effect of injuring a competitor and where the effect may be to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade, is an unfair trade practice."

Rule 4, as published April 15, 1930, which

the Commission declined to approve or accept, reads as follows:

"The secret prepayment of transportation charges and/or the secret payment or allowance of rebates, refunds, credits, or unearned discounts whether in the form of money or otherwise, or secretly extending to certain purchasers special service or privileges not extended to all purchasers under like terms and conditions, with the intent and with the effect of injuring a competitor and where the effect may be to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade, is an unfair trade practice."

Rule 5. The commission substituted and approved the following for Rule 5, as published April 15, 1930:

"It is an unfair trade practice for any person engaged in interstate commerce, in the course of such commerce, either directly or indirectly, to discriminate in price between different purchasers of commodities, where the effect of such discrimination may be to substantially lessen competition or tend to create a monopoly in any line of commerce; provided that nothing herein contained shall prevent discrimination in price between purchasers of the same class on account of differences in the grade, quality or quantity of the commodity sold, or that makes only due allowance for differences in the cost of selling or transportation, or discrimination in price in the same or different communities made in good faith to meet competition; and provided further, that nothing herein contained shall prevent persons engaged in selling the products of this industry in commerce from selecting their own customers in bona fide transactions and not in restraint of trade."

Rule 5, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"Any discrimination in price between purchasers of the same class, not including discrimination in price on account of the difference in grade, quality or quantity of the product sold, or which makes only due allowance for difference in cost of selling and transportation, or discrimination in price in the same or different communities made in good faith to meet competition, where the effect of such discrimination may be to substantially lessen competition or tend to create a monopoly, is an unfair trade practice."

Rule 6. The Commission substituted and approved the following for Rule 6, as published April 15, 1930:

"The defamation of competitors by falsely imputing to them dishonorable conduct, inability to perform contracts, questionable credit standing, or by other false representations, or the false disparagement of the grade or quality of their goods, with the tendency and capacity to mislead or deceive purchasers or prospective purchasers, is an unfair trade practice."

Rule 6, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The defamation of a competitor by words or acts imputing to him dishonorable conduct, inability to perform contracts, or questionable credit standing, or the false disparagement of the grade or quality of his materials, is an unfair trade practice."

Rule 7. The Commission approved Rule 7, as published April 15, 1930, which reads as follows:

"The selling of goods below cost with the intent and with the effect of injuring a competitor and where the effect may be to substantially lessen competition or tend to create

a monopoly or to unreasonably restrain trade, is an unfair trade practice."

Rule 8. The Commission substituted and approved the following for Rule 8, as published April 15, 1930:

"Directly or indirectly to give or permit to be given or offer to give money or anything of value to agents, employees, or representatives of customers or prospective customers, or to agents, employees or representatives of competitors' customers, or prospective customers, without the knowledge of their employers or principals, as an inducement to influence their employers or principals to purchase or contract to purchase industry products from the maker of such gift or offer, or to influence such employers or principals to refrain from dealing or contracting to deal with competitors, is an unfair trade practice."

Rule 8, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The secret paying, or promising to pay, to an employee of a customer or prospective customer, without the knowledge of his employer, of a commission or consideration of any character for the purpose of inducing or compensating for a sale, is an unfair trade practice."

Rule 9. The Commission substituted and approved the following for Rule 9, as published April 15, 1930:

"Maliciously enticing away the employees of competitors with the purpose and effect of unduly hampering, injuring, or embarrassing competitors in their businesses is an unfair trade practice."

Rule 9, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The enticement of employees from a competitor for the purpose of interfering with his business is an unfair trade practice."

Rule 10. The Commission substituted and approved the following for a part of Rule C, Group II, as published April 15, 1930:

"Offering for sale merchandise at a price reduced from a marked-up or fictitious price with the tendency and capacity to mislead or deceive purchasers or prospective purchasers is an unfair trade practice."

Rule C, Group II, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The industry hereby records its approval of the practice of each individual independently publishing his prices and terms of sale to the purchasing trade. The publication of fictitious prices and terms of sale by a manufacturer for the purpose of misleading the trade and the public is condemned by the industry."

Group II Rules

Rule A. The Commission substituted and accepted the following for a part of Rule C, as published April 15, 1930:

"(a) The industry approves the practice of each individual member of the industry independently publishing and circulating to the purchasing trade its own price lists."

"(b) The industry approves the practice of making the terms of sale a part of all published price schedules."

Rule C, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The industry hereby records its approval of the practice of each individual independently publishing his prices and terms of sale to the purchasing trade. The publication of fictitious prices and terms of sale by a manufacturer for the purpose of misleading the

trade and the public is condemned by the industry."

Rule B. The Commission substituted and accepted the following for Rule D, as published April 15, 1930:

"A Committee on Trade Practices is hereby created to cooperate with the Federal Trade Commission and to perform such acts as may be proper to put these rules into effect."

Rule D, as published April 15, 1930, which the Commission declined to approve or accept reads as follows:

"The Crushed Stone Industry hereby authorizes the National Crushed Stone Association to take such steps as may be necessary to appoint a Committee on Trade Practices to investigate whether these resolutions are being observed, to make complaints concerning alleged violations, cooperate with the Federal Trade Commission and generally to perform such other acts as may be reasonably necessary and proper to put these resolutions into effect and to accomplish the objects and purposes of this Conference."

The Commission declined to approve or accept the following rules as published April 15, 1930:

Rule A, Group II. "The offering or giving of commissions, prizes, premiums, gifts or excessive entertainment to anyone in connection with the sale, purchase or use of any product distributed by manufacturers within this industry, or as an inducement thereto, is condemned by the industry."

Rule B, Group II. "The practice of making sales on an f.o.b. factory basis on all shipments except within local delivery limits enables the purchaser to know the cost of the product, exclusive of freight charges, and is a commendable custom and recommended by the industry."

Registration

- A. L. Worthen, chairman, the Connecticut Quarries Co., New Haven, Conn.
 Max A. Altgelt, Servtex Materials Co., New Braunfels, Tex.
 William M. Andrews, Lake Erie Limestone Co., Youngstown, Ohio.
 J. E. Cushing, Cushing Stone Co., Schenectady, N. Y.
 C. M. Doolittle, Canada Crushed Stone Corp., Hamilton, Ont., Canada.
 F. O. Earnshaw, Carbon Limestone Co., Youngstown, Ohio.
 Otho M. Graves, General Crushed Stone Co., Easton, Penn.
 F. T. Gucker, John T. Dyer Quarry Co., Norristown, Penn.
 William E. Hilliard, New Haven Trap Rock Co., New Haven, Conn.
 E. J. Krause, Columbia Quarry Co., St. Louis, Mo.
 A. S. Lane, John S. Lane and Son, Inc., Meriden, Conn.
 B. A. McKinney, West Roxbury Trap Rock Co., West Roxbury, Mass.
 Russell Rarey, Marble Cliff Quarries Co., Columbus, Ohio.
 John Rice, General Crushed Stone Co., Easton, Penn.
 J. A. Rigg, Acme Limestone Co., Alderson, W. Va.
 W. R. Sanborn, Lehigh Stone Co., Kankakee, Ill.
 James Savage, Buffalo Crushed Stone Co., Buffalo, N. Y.
 F. W. Schmidt, North Jersey Quarry Co., Morristown, N. J.
 W. L. Spurborg, General Crushed Stone Co., Syracuse, N. Y.
 T. I. Weston, Weston and Brooker Co., Columbia, S. C.
 B. G. Shotton, chairman of the Manufacturers' Division, Hendrick Manufacturing Co., Pittsburgh, Penn.
 H. M. Davison, Harnischfeger Sales Corp., Milwaukee, Wis.

OTHERS PRESENT

- J. Barab, Hercules Powder Co., Wilmington, Del.
 E. M. Buck, Pit and Quarry, Chicago, Ill.
 C. B. Andrews, Taylor-Wharton Iron and Steel Co., High Bridge, N. J.
 J. R. Boyd, National Crushed Stone Association, Washington, D. C.
 A. T. Goldbeck, National Crushed Stone Association, Washington, D. C.
 E. G. Lewis, Bucyrus-Erie Co., New York City.

P. B. Reinhold, Reinhold and Co., Inc., Pittsburgh, Penn.
 Nathan C. Rockwood, ROCK PRODUCTS, Chicago, Ill.
 Harold Williams, Boston, Mass.
 E. T. Wolf, E. I. du Pont de Nemours and Co., Inc., Wilmington, Del.

Indiana County Considers Entering Road Construction Business

VANDERBURGH county, Indiana, may go into the gravel-road contracting business in the interest of economy.

In announcing that county commissioners would give consideration to building its own gravel roads, Auditor Koenemann said the county had improved the Stacer road at a cost of some \$6000, a saving of several thousand dollars to taxpayers.

The county, he said, is equipped to do all the work, from excavating and constructing the base to spreading the gravel.

Mr. Koenemann said this would require an increase in next year's gravel-road fund, but that it would eventually lower taxes by reducing the bonded indebtedness.—*Evansville (Ind.) Press.*

Claim Unfair Competition in Gypsum Board Description

A COMPLAINT has been entered by the Federal Trade Commission charging the United States Gypsum Co., Chicago, Ill., with unfair business methods.

The brief not only charges that Sheetrock and Rocklath "are not fireproof and buildings and walls of buildings in which they are used are not by their use made fireproof" but also that they "are not rock, as defined geologically or rock within the meaning of the term rock, as commonly or popularly understood by the public." The company is charged with showing why it should not be ordered to refrain from using the word "rock" in designating its wallboard products.

Various advertisements published since 1920 are quoted showing that Sheetrock was described as being fireproof and enduring.

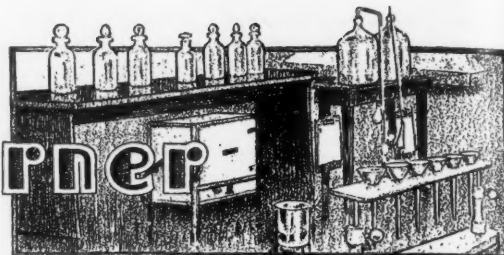
Consider Stone as Alternate to Gravel

ASHTABULA COUNTY, Ohio, commissioners are considering the alternative of crushed stone to be used on the Seven Hills road improvement in place of gravel.

The distance to be improved is nearly nine-tenths of a mile. After deducting \$400, the amount Plymouth township will contribute, with \$360 from the county and the voluntary contribution of A. L. Gregory, there will remain \$2,700 to be assessed against the abutting property owners. In view of low bids on materials it is believed a crushed stone road 16 ft. in width may be constructed to advantage.—*Ashtabula (Ohio) Star Beacon.*



The Chemists' Corner



Determination of the Cement Content of Cement-Lime Mortars

By Thomas F. Mullan and Eugene A. Ledyard

CURRENT METHODS recommended for the estimation of the cement content of cement-lime mortars are based upon the determination of soluble silica in the hydrated mortar. Our experiments have shown that the soluble silica introduced by the sand used is appreciable, and by no means a constant quantity in different localities. Although it is neglected in present methods we wish to emphasize the necessity of correcting for soluble silica from sand. In Table I are shown eight samples of sand representing as many sources, from five localities of southern California.

TABLE I. SHOWING VARIABLE AMOUNTS OF SOLUBLE SILICA IN SAND

| Sand number | Locality | Source | Per cent. insoluble residue | Per cent. soluble silica |
|--------------------------------------|----------|--------|-----------------------------|--------------------------|
| 1 | A | 1 | 94.90 | 1.37 |
| 2 | A | 2 | 94.55 | 1.54 |
| 3 | B | 1 | 92.93 | 2.09 |
| 4 | C | 1 | 93.69 | 1.57 |
| 5 | D | 1 | 97.34 | 0.76 |
| 6 | D | 2 | 97.32 | 0.81 |
| 7 | E | 1 | 96.05 | 0.92 |
| 8 | E | 2 | 95.56 | 1.03 |
| 9—Composite No. 1 to No. 8 Incl..... | | | 95.00 | 1.29 |

In Table II, below, are shown the results of tests made on experimental mortars. The mortar mixtures were prepared by mixing cement, lime putty and sand by weight and then allowing the mortar to set for 7 and 28 days before analysis. The last three columns show the cement-sand ratios calculated by the proposed method. The first two columns are corrected for soluble silica in the sand (previously determined) and in the last column this correction has been neglected.

The proposed method of calculation expresses the results as the ratio of cement to sand in the original mixture and involves only the analytical steps necessary to obtain the corrected soluble silica content of the mortar. The common method of interpreting the results of analyses as per cent. of cement in a dried sample is obviously incorrect when allowance is not made for the soluble silica in the sand. Also, the dried sample contains an uncertain amount of combined water and carbon dioxide which renders such results indefinite in meaning. A

determination of the loss on ignition and water content might make the results more definite but the sand itself might have an appreciable loss and in any event the lime would be dehydrated. Hence, aside from the additional analytical work necessary, interpretation in terms of original mix is rather more involved. The following method and calculations are direct and obvious.

Analytical Procedure

Dry the mortar sufficiently to pulverize to pass an 80-mesh screen. To a 2.5 g. sample add 50 cu. cm. 1:5 HCl. Digest 30 min. with occasional stirring (do not boil). Filter and wash the residue, reserve filtrate (A). Digest the residue in 25 cu. cm. of 5% Na_2CO_3 solution for 15 min., stirring frequently. Filter and wash thoroughly; reserve filtrate (B). Ignite residue and report as *insoluble residue*.

Combine filtrates (A) and (B) with care, render acid, evaporate and determine SiO_2 in the usual manner. Report as *soluble silica*.

Interpretation of Results

To determine accurately the corrected value of soluble silica in a mortar contrib-

uted by the cement present, it is necessary to know the amount contributed by the sand present. This can only be done by submitting a sample of the sand used to the same procedure. As shown in Table I, general sand constants for soluble silica and insoluble cannot be used. The following method of calculation involves the use of three constants as follows:

C_s = soluble silica in dry cement

S_s = soluble silica in dry sand

S_i = insoluble residue in dry sand

Let x = weight of cement in a unit of mortar

y = weight of sand in a unit of mortar

C_i = insoluble residue in dry cement (negligible; let $C_i = 0$)

Then: (1) $x(C_i) + y(S_i) = M_i$ = insoluble residue of mortar

(2) $x(C_s) + y(S_s) = M_s$ = soluble silica of mortar

Since C_i is negligible: $y = \frac{M_i}{S_i}$

Substituting for y in (2) we have:

$$x(C_s) + \frac{M_i S_s}{S_i} = M_s$$

$$M_s - \frac{M_i S_s}{S_i}$$

$$\text{or, } x = \frac{M_s - \frac{M_i S_s}{S_i}}{C_s} = \frac{M_s}{C_s} - \frac{M_i S_s}{C_s S_i}$$

We now have a value for x that represents that quantity of cement existing in a unit of hydrated mortar. The value of y expresses that quantity of sand existing in an equivalent unit of hydrated mortar. The purpose of this method is to establish a ratio of cement to sand that existed in the unhydrated mortar, as indicated in our chosen constants.

TABLE II. RESULT OF TESTS ON EXPERIMENTAL MORTARS

| Test number | Sample | Parts by weight Cement Lime Sand | | | Per cent. insoluble residue | | Per cent. soluble SiO_2 | | Calculated cement-sand ratios | | |
|-------------|--------|-------------------------------------|---|---|--------------------------------|--------|-------------------------------------|--------|-------------------------------|---------------|--------|
| | | | | | | | | | Corrected | Not corrected | |
| | | | | | 7-day | 28-day | 7-day | 28-day | 7-day | 28-day | 7-day |
| 1 | Cement | | | | 0.04 | | 20.26 | | | | |
| 2 | Lime* | | | | 0.08 | | 0.07 | | | | |
| 3 | Sand | | | | 95.00 | | 1.29 | | | | |
| 4 | Mortar | 1 | 1 | 4 | 69.71 | 70.34 | 4.68 | 4.48 | 1:3.98 | 1:4.25 | 1:3.18 |
| 5 | Mortar | 1 | 1 | 5 | 74.28 | 73.86 | 4.00 | 4.06 | 1:5.17 | 1:5.14 | 1:3.97 |
| 6 | Mortar | 1 | 1 | 6 | 76.90 | 76.41 | 3.71 | 3.67 | 1:6.14 | 1:6.20 | 1:4.42 |
| 7 | Mortar | 1 | 2 | 7 | 75.67 | 75.36 | 3.36 | 3.29 | 1:6.96 | 1:7.08 | 1:4.80 |
| 8 | Mortar | 1 | 1 | 8 | 71.13 | 70.76 | 3.12 | 3.12 | 1:7.06 | 1:6.99 | 1:4.86 |
| 9 | Mortar | 1 | 1 | 8 | 81.68 | 80.88 | 3.28 | 3.20 | 1:8.02 | 1:8.21 | 1:5.31 |

*Lime used was the regular lime-putty supplied by a local mixing plant.

TABLE III. CALCULATED RATIOS—CEMENT TO SAND
(Table II Constants Used in Calculations)

| Parts by weight in mortars | Composite* | Sand | | | | | | | |
|----------------------------|------------|--------|--------|---------|--------|--------|--------|--------|--------|
| | | No. 1 | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 | No. 7 | No. 8 |
| 1:1.4 | 1:3.98 | 1:4.07 | 1:4.22 | 1:4.90 | 1:4.30 | 1:3.51 | 1:3.54 | 1:3.67 | 1:3.76 |
| 1:1.5 | 1:5.17 | 1:5.41 | 1:5.70 | 1:6.95 | 1:5.82 | 1:4.52 | 1:4.58 | 1:4.76 | 1:4.92 |
| 1:1.6 | 1:6.14 | 1:6.32 | 1:6.70 | 1:8.45 | 1:6.87 | 1:5.15 | 1:5.21 | 1:5.46 | 1:5.66 |
| 1:2.7 | 1:6.96 | 1:7.12 | 1:7.60 | 1:9.94 | 1:7.83 | 1:5.66 | 1:5.77 | 1:6.05 | 1:6.32 |
| 1:3.7 | 1:7.06 | 1:7.26 | 1:7.78 | 1:10.20 | 1:7.97 | 1:5.78 | 1:5.85 | 1:6.15 | 1:6.42 |
| 1:1.8 | 1:8.02 | 1:8.30 | 1:8.98 | 1:7.30 | 1:9.25 | 1:6.44 | 1:6.54 | 1:6.89 | 1:7.21 |

*Composite of all sands tested. This composite sand sample was used in the experimental mortars.

However, y = units of sand per unit of cement in the unhydrated mortar as well as x in the hydrated mortar, for if the ratio of two constituents in a mixture is determined, that ratio does not change upon removal or addition of another constituent of the mixture.

It is possible that serious errors will not result when average values for similar sands are used. As shown in Table I, the sands of the same locality, though from different

sources, are somewhat similar. Perhaps local sand constants can be established, then it need only be necessary to know the source of the sand used in the mortar and the constants established for that locality used in the interpretation of results.

In Table III are expressed the ratios of cement to sand using the various sand constants determined on each sand but using the results of analysis obtained when the composite sand was used in the mortars.

lime in the same way. The final form of the method as described by Lerch and Bogue has been found by other workers to give good results with unhydrated portland cements, and has been largely adopted for testing for free lime for routine and research purposes.

Though fairly satisfactory for such materials, it suffers from certain minor disadvantages. It is not easy to obtain a sharp end-point in the presence of colored material, and the excess, if any, of the added reagent during the titration may react with the cement. The necessity of boiling off the ammonia formed during the titration also tends to complicate the end-point. The method is not difficult to carry out, but is somewhat tedious, and occupies a considerable amount of time if the free lime content of the sample is high.

In the modification recently described by Rathke the lime is completely dissolved by heating the sample gently with anhydrous glycerol in a closed vessel for some hours before titrating. An alcoholic solution of tartaric acid is substituted for that of ammonium acetate for titration.

Examination of Methods

Tests on cements and sand-lime brick have been carried out using both Lerch and Bogue's and Rathke's methods. The only modification found desirable in Lerch and Bogue's procedure was the substitution of 30 minutes' for 10 minutes' boiling before the final titration to complete the dissolution of the last traces of free lime. Duplicate determinations on a number of cements and sand-lime bricks which are shown in the table, columns 2 and 3, are seen to yield consistent results.

A Modification of Glycerol Method for Determination of Free Lime*

By G. E. Bessey

IN THE COURSE of investigations on the determination of uncombined lime in cements and other building materials a modification of the glycerol extraction method originally suggested by Maynard,¹ which appears to have definite advantages over previous forms, has been worked out. Modifications of the original method have been proposed successively by Emley,² Lerch and Bogue,³ and Rathke.⁴

All the methods make use of the fact that glycerol forms with calcium oxide a glycerolate (glyceroxide) which is soluble in both glycerol itself and in mixtures of glycerol and alcohol. Calcium oxide and calcium hydroxide both dissolve very slowly in glycerol, dissolution being slower with the hydroxide, but quantities of either not exceeding 0.05 g. can be dissolved in 20-30 c.c.

of glycerol in a few hours if maintained at 60-80 deg. and occasionally shaken.

The compound is partly hydrolyzed by water. Maynard's method was to heat 0.5 g. of the sample with 50 c.c. of glycerol at about 40 deg. for several days with occasional shaking. An aliquot portion of the solution was then filtered directly or diluted with alcohol and filtered, and the calcium oxide determined in the filtrate.

In the method devised by Emley for sand-lime bricks, and applied by Lerch and Bogue to cements, the sample is boiled with an alcohol-glycerol mixture and titrated while hot with an alcoholic solution of ammonium acetate, using phenolphthalein as indicator.

The operations of boiling and titrating are repeated until the pink color does not reappear on boiling for several minutes.

The ammonium acetate solution is standardized by titration of pure freshly ignited

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TABLE 1—FREE LIME IN CEMENTS AND SAND-LIME BRICKS BY GLYCEROL EXTRACTION METHODS (CaO%)

| Sample | Ammonium acetate | | Tartaric acid (Rathke) | | Benzoic acid | |
|---|------------------|-------|------------------------|-------|------------------|-------|
| | Actual | Mean | Actual | Mean | Actual | Mean |
| 1. Portland cement: A..... | 2.94 } 2.90 } | 2.9 | 4.89 } 5.62 } | 5.3 | 3.13 } 3.20 } | 3.2 |
| 2. Portland cement: B..... | 1.51 } 1.67 } | 1.6 | ..... | ..... | 2.01 } 2.14 } | 2.1 |
| 3. Rapid-hardening portland cement: A..... | 2.81 } 2.94 } | 2.9 | 2.64 } 2.92 } | 2.8 | 2.61 } 2.64 } | 2.6 |
| 4. Rapid-hardening portland cement: B..... | 0.94 } 1.16 } | 1.1 | 3.07 } 2.90 } | 3.0 | 1.77 } 1.38 } | 1.6 |
| 5. Portland cement clinker..... | 0.75 } 1.04 } | 0.9 | ..... | ..... | 1.76 } 1.78 } | 1.8 |
| 6. Portland blast-furnace cement: A..... | 0.13 } 0.13 } | 0.1 | 0.4 } 0.4 } | 0.4 | ..... | ..... |
| 7. Portland blast-furnace cement: B..... | 1.74 } 2.24 } | 2.0 | 2.36 } 2.50 } | 2.4 | 1.45 } 1.70 } | 1.6 |
| 8. Cold-process slag cement..... | 9.61 } 9.71 } | 9.7 | ..... | ..... | 9.30 } 9.25 } | 9.3 |
| 9. Aluminous cement (fondu)..... | Nil | Nil | Nil | Nil | Nil | Nil |
| 10. Aluminous cement (English)..... | Nil | Nil | Nil | Nil | Nil | Nil |
| 11. Set portland cement..... | 11.5 } 12.1 } | 11.8 | ..... | ..... | 13.2 } 13.6 } | 13.4 |
| 12. Set aluminous cement..... | 0.05 | Trace | ..... | ..... | 0.07 | Trace |
| 13. Sand-lime brick: A (laboratory prepared)..... | Nil | Nil | Nil | Nil | Nil | Nil |
| 14. Sand-lime brick: B (laboratory prepared)..... | 6.1 | 6.1 | ..... | ..... | 5.3 | 5.3 |
| 15. Sand-lime brick: commercial sample A..... | Nil | Nil | ..... | ..... | Nil } Trace } | Trace |
| 16. Sand-lime brick: commercial sample B..... | Nil | Nil | ..... | ..... | 0.15 } Nil } | Trace |
| 17. Sand-lime brick: commercial sample C..... | 0.57 | 0.6 | ..... | ..... | 0.52 } 0.66 } | 0.6 |
| 18. Sand-lime brick: commercial sample D..... | 1.48 | 1.5 | ..... | ..... | 1.31 } 1.52 } | 1.4 |

The modification suggested by Rathke was examined more completely, since it appeared to offer certain advantages over the previous methods. It was found, however, to suffer from other disadvantages which rendered it unsatisfactory. The end-point was very difficult to observe accurately, as the tartaric acid formed a gelatinous precipitate on reaction with the lime, and this precipitate tended to adsorb the phenolphthalein slightly.

Moreover the standardization of an accurate 0.1N-solution of tartaric acid by pure calcium oxide showed a very abnormal value, probably due to the formation of a complex of calcium with the hydroxyl groups in the tartaric acid molecule. Duplicate determinations on a number of samples are shown in Table I, columns 4 and 5. The mean results do not agree well with those by the ammonium acetate method, and the individual results do not agree amongst themselves.

A Modification of the Method Gives Good Results

A modification of this method has, however, been worked out at the Building Research Station which yields satisfactory results. The end-point of the titration was somewhat improved by using the phenolphthalein indicator externally on a white porcelain tile, but is still not sharp. The other change made was the substitution of benzoic acid for tartaric acid, the calcium salt of the former acid being freely soluble in the alcohol-glycerol mixture. Although benzoic acid is definitely monobasic, an empirical standardization of the standard solution is still required, and is carried out by titration of pure calcium oxide after dissolution in glycerol, as described later.

The theoretical equivalence for 0.1N-acid is 1 c.c. = 0.0028 g. CaO. Actually it is normally found in the standardization by calcium oxide to be of the order 0.0030-0.0035 g. CaO. Two reasons may be suggested for this. The compound formed by the glycerol and lime is partly hydrolyzed in solution, and hence will be in equilibrium with its hydrolysis products, glycerol and calcium hydroxide. When the calcium hydroxide has been removed by the benzoic acid down to the p_n of color change of phenolphthalein, the equilibrium may be such that hydrolysis is incomplete, and hence the whole of the lime is not titrated.

This is probably the less important of the reasons for the abnormal standardization, the other and more important being the formation of a small proportion of a more stable compound or compounds with acidic materials developed in the glycerol during heating. It has been found that previous heating of the glycerol in an open dish causes a considerable increase in the abnormality of the results, and considerable discoloration of the solution is observed after heating with the lime; it is probable that the oxidation which takes place in this case does so to a smaller extent in the actual deter-

mination, thus causing the abnormal equivalence.

It does not appear possible to say whether this effect is completely allowed for by the empirical standardization, and it is possible that a small error is involved. Since, however, the value obtained in standardization is independent of the weight of lime taken, the effect of the above would appear to be nearly proportional to the amount of lime present, and hence the error due to this is likely to be small.

Method of Procedure

The procedure with the modified method is as follows: A standard 0.1N-solution of benzoic acid in anhydrous ethyl or methylated alcohol is prepared. This is stored in a vessel closed to the air and attached to an automatic burette which is protected by a guard-tube containing phosphorous pentoxide. The burette should have a glass bead valve or pinch-cock in place of a glass tap, since the latter cannot be satisfactorily lubricated with an alcoholic solution.

Glycerol is required which shall be of not less than 99.2% purity, and free from any acidity. A commercial product of this purity is available. The ordinary "A.R." product containing some 2% of water is not satisfactory, as appreciable hydrolysis of compounds of lime in the sample may take place. The difference between results when using the 99.2% pure and 100.0% pure glycerol, prepared by distillation *in vacuo*, was found to be inappreciable. The glycerol is stored in a vessel attached to an automatic pipette and having a phosphorus pentoxide guard tube.

Lime Is Added

The solution of benzoic acid is standardized by pure calcium oxide, preferably prepared from pure calcium carbonate ignited at 1000 deg. to constant weight. The "A.R." grade of precipitated carbonate gives the finest grained and most reactive product. For standardization 0.02 to 0.5 g. of the pure, freshly ignited lime is added to 20 c.c. of the glycerol in a 100-c.c. conical flask, and the latter tightly stoppered by a glass or rubber stopper and well shaken. It is important to add the lime to the glycerol and not *vice versa*, as otherwise there is a tendency for the lime to cake on the bottom and make dissolution difficult.

The flask is placed on a hot-plate or in an oven at 60 to 80 deg. for 24 hr. and shaken at intervals; at the end of this period all the lime should have completely dissolved. Then 20-30 c.c. of the alcohol are added, the mixture is shaken and titrated with the benzoic acid, using phenolphthalein as indicator. The titration may be carried out using the indicator internally or externally, as the result is practically the same in the clear solution. The end-point is not sharp, but may be read to within 0.2 c.c. of 0.1N-acid.

For actual determinations sufficient sample to give not more than 0.05 g. of free lime

(i.e., 1 g. where the free lime content is less than 5%) is weighed and added to 20 c.c. of glycerol, and treated as in the standardization. The indicator should be used externally, and the end-point taken when no pink color develops on addition of a drop of the titrated solution to a drop of the phenolphthalein solution on a tile.

The sample normally requires to remain in contact with glycerol for 24 hr. at 60-80 deg., but where the free lime content is very low 5-6 hr. is sufficient.

Applicability and Accuracy of Methods

The modified glycerol method described above has been applied with fairly satisfactory results to sand-lime bricks and to unhydrated cements, but has certain possible sources of error, the importance and magnitude of which are at present not certain. Comparative results with the ammonium acetate modification are shown in Table I. It is seen that consistent results are obtainable, and that agreement between the methods is usually good, although occasionally appreciable differences are obtained in the case of cements. There is, however, no readily available means of checking the absolute accuracy of either method.

White's qualitative microscopic test⁵ shows good agreement when only very small quantities are present, but cannot be used to determine appreciable amounts. The ammonium acetate-glycerol method has been tested on the individual compounds occurring in cement by Emley and by Lerch and Bogue; further, both methods have been shown not to give high results with sand-lime bricks during the present investigation, since a zero result is obtained with samples having no free lime present.

These methods are not applicable to hydrated materials other than sand-lime bricks, as calcium hydroxide is only slowly dissolved by the glycerol, and, in the case of hydrated cements, the small amounts of water formed during the reaction cause uncertain errors in the result. Other methods have been devised for such materials, and are described elsewhere.⁶

Summary

The glycerol extraction methods of determining free lime in cements and sand-lime bricks are discussed. A modification is described in which the free lime is extracted by glycerol alone and titrated by alcoholic benzoic acid solution; it is rather simpler to carry out than methods hitherto used. The applicability and accuracy of the methods are briefly discussed.

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- ² Trans. Amer. Ceram. Soc., 1915, 17, 720.
- ³ Ind. Eng. Chem., 1926, 18, 739.
- ⁴ Tonind. Ztg., 1928, 52, 1318.
- ⁵ J. Ind. Eng. Chem., 1909, 1, 5.
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Norman Hough Discusses Lime with Chattanooga Engineers

TENNESSEE is an important factor in the lime industry, ranking sixth in the point of production, and being at the top insofar as the quality of the product is concerned, Norman G. Hough, president of the National Lime Association, Washington, D. C., told members of the Chattanooga Engineers' club at the weekly meeting held July 13.

In his remarks Mr. Hough dwelt upon the importance of the lime industry to every individual in the country, pointing out that the industry has three distinct channels of distribution; construction lime, industrial lime and agricultural lime.

"Few people realize the breadth of usage of this material, but it is a fact that it is used in the manufacture of many of our everyday commodities," he said. It is being used in something like 200 industries.

Mr. Hough pointed out also that in masonry construction there is present a tendency among architects, engineers and builders to increase the quantity of lime in mortars for laying up brick or stone work. Extensive research and field observations indicate that a mortar of this type is thought to be a major factor in the solution of the leaky wall problem.

Mr. Hough closed his discussion by stating that the National Lime Association has been organized over a period of years for the purpose of developing a better appreciation of the economic value of lime in all of its uses and to improve the industry and its products in order that it may better serve the public.—*Chattanooga (Tenn.) News.*

Artificial Aggregate Developed in Germany

A NEW BUILDING MATERIAL consisting of artificial pumice has appeared on the German market, according to a report issued by the Department of Commerce. Hitherto only natural pumice has been used for building material of this type. Numerous experiments have shown, according to the Germans, that this material has considerable advantage over the natural pumice sand. It is claimed to be an excellent fireproof material, and that it can also be used to advantage as a concrete admixture, needing only to be thoroughly moistened to obtain a satisfactory binding with cement. Sheets of concrete using the substance as a component are produced in thicknesses of 10 cm. and can be easily cut out and shaped. It is also said to be a good base for linoleum.

The main use intended for the new material is in the manufacture of hollow blocks. As it is reported to be cheaper and lighter than bricks, the German building trade anticipates that its use will be of considerable economic advantage.

Tests on Concrete Transported in Revolving Truck Body

THE RESULT of tests to determine the effect of transporting concrete in a Clinton concrete conveyor are given in a recent publication by the Clinton Motors Corp., Reading, Penn.

These tests, by Willis A. Slater, director of the Fritz Engineering Laboratory of Lehigh University, assisted by W. M. Dunagan, professor, of Iowa State College, covered the entire process of mixing and placing concrete.

Seven gal. of water were used per bag of cement. Samples were taken after the first seven min. and then at 30 min. intervals. Four test runs were made and compression tests were made at 1, 2, 4, 7, 14, and 28 days. Two brands of cement were used.

The conclusions drawn from these tests follow:

The slump was generally about 8 in. as the concrete came from the mixer, but decreased very consistently during the time that it was in the conveyor drum. Even after 2½ hr. in the conveyor, the consistency was such that the concrete could have been used quite satisfactorily for road or pavement work, where the requirements are particularly rigid.

The amount of water and the sum of the absolute volumes of the cement and aggregates remained practically constant throughout each run. The amount of cement, however, appeared to increase. As this apparent increase was about the same as the decrease in the absolute volume of the sand, it is likely that it was due to the pulverizing of the aggregates, especially the sand.

The apparent increase in cement content in a batch of concrete mixed in a Jaeger mixer for 1 hr. and 15 min. was much greater than that in the drum of the conveyor and the stiffening of the batch was correspondingly more marked.

There was no indication of segregation of the concrete in the conveyor drum as observed visually, or as determined by testing the composition of the concrete.

The strength of the concrete from sam-

ples taken at successive intervals after charging the conveyor drum, increased progressively according to the length of time during which the sample had been transported in the conveyor. The difference between the length of time of initial set of the two cements used had no effect on the behavior of the conveyor so far as such effects could be observed or measured in a test of this sort.

Decrease in Production of Feldspar in 1930

THE CRUDE FELDSPAR sold or used by producers in the United States in 1930 amounted to 171,788 long tons, valued at \$1,066,636, or \$6.21 a ton, as announced by the United States Bureau of Mines, Department of Commerce. These figures show a decrease of 13% in quantity and 16% in total value in comparison with 1929. Feldspar was reported as having been mined and sold in 1930 in 10 states. The greatest feldspar producing region is that which includes the Atlantic seaboard states from Maine to North Carolina. This region reported about 91% of the total output and value in 1930. North Carolina, the leading state, reported 60% of the total output; Maine, the second state, reported 13%; and New Hampshire, the third state, 10%. The average value per long ton in North Carolina was \$5.75; in Maine, \$7.11, and in New Hampshire, \$8.01.

Except for minor purposes, feldspar is prepared for use by grinding. This work is done principally by commercial mills; only a very small portion is ground by users in their own mills. In 1930 there were 34 commercial mills operated in 12 states. These mills reported 181,541 short tons of ground feldspar sold in 1930, valued at \$2,450,915, or \$13.50 a ton, compared with 230,582 tons, valued at \$3,296,252, or \$14.30 a ton, in 1929. Of the quantity of ground spar sold in 1930, 167,380 short tons, valued at \$2,167,352 (or \$12.95 a ton) was domestic feldspar. These figures represent a large decrease in imported feldspar ground as compared with 1929.

The production of crude feldspar by states in 1929 and 1930 is shown in the following table:

CRUDE FELDSPAR SOLD OR USED BY PRODUCERS IN THE UNITED STATES
IN 1929 AND 1930

| State | Long tons—1929—Value† | Long tons—1930—Value† |
|----------------|-----------------------|-----------------------|
| Arizona | (*) (*) | (*) (*) |
| California | 12,770 \$ 84,567 | 6,519 \$ 54,941 |
| Colorado | (*) (*) | 1,933 10,575 |
| Connecticut | 2,726 21,056 | (*) (*) |
| Maine | 19,992 142,042 | 22,738 161,631 |
| Maryland | 2,624 19,610 | |
| New Hampshire | 30,964 231,810 | 16,517 132,342 |
| New York | 12,696 103,531 | 5,556 37,790 |
| North Carolina | 103,273 598,938 | 103,163 593,552 |
| Pennsylvania | (*) (*) | (*) (*) |
| South Dakota | (*) (*) | (*) (*) |
| Virginia | 6,677 38,628 | 6,760 38,048 |
| Undistributed | 5,977 36,458 | 8,602 37,757 |
| | 197,699 \$1,276,640 | 171,788 \$1,066,636 |

†Value at mine or nearest shipping point. *Included under "Undistributed."



Hints and Helps for Superintendents

Tool House Checking System

IN THE MACHINE SHOP of the Consolidated Quarries Corp., Lithonia, Ga., a system has been adopted of issuing all tools for use in the plant and quarry on a checking system. This system, while it may appear expensive and involved, has resulted in savings when considering the first cost of the tools and also has shown a profit from that intangible cost factor of having a tool available in a hurry for emergency repairs. The shop is midway between the quarry and the plant so that tools can be quickly had by either department.

Some Operating Ideas from a Small Quarry

By Thomas H. Wittkorn
Philadelphia, Penn.

ONE of the very few blue limestone quarries in the Philadelphia district with a product suitable for building stone is located at Howellville, Chester county, and has recently been acquired by W. Ellis Johnson, who is now putting it on a modern operating basis. Under the superintendency of J. W. S. Jarman, the activities around this old working of an unusual rock formation are fast making it a factor in the supply of material for the many new projects in the metropolitan area.

The most radical move under the new ownership has been the elimination of three horses to move the stone from the breast of

the quarry to the foot of the hoist and using in their place a Plymouth gasoline locomotive. This has resulted in a material increase in the daily output and allows a more efficient operation of the other equipment of the plant.

Eight spur tracks now lead into the breast of the quarry, which measures about 250 ft., on which are steel dump cars with a capacity of 2 to 2½ tons each. One car goes to the end of each track and two men load it. They are paid on a tonnage basis which is carefully checked by a tag system.

After the men load a car they attach a tag to it which carries their number and is finally returned to them. When the car reaches the hoist, the hooker-on, who keeps a tally of the number of cars going up, marks on the tag the consecutive number of each man's car, and keeps a record of it for himself. The scales are at the top of the hoist so when the cars are weighed there the weight of the stone is placed on the tag and it is removed.

Twice a day, noon and night, all the tags are taken to the office, where an adding machine gives an accurate record of each loading team's work, as well as figures on the daily production. At the end of every two weeks all the tags are returned to the men who originally placed them on the cars, so that they may check up, if they so desire, with their pay envelopes.

After the cars are loaded two men with the locomotive take the cars to the hoist and return the empties. One man acts as engineer and the other hops off and on to

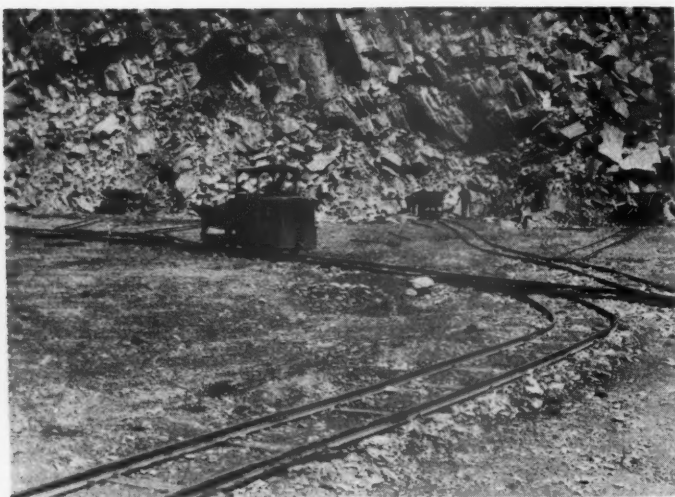
throw the switches. These are active young Americans, while the loading crews are Italians.

In order to keep the cars in the right position all the time a Y has been laid on the quarry floor, and it is surprising with what speed the two loaded or empty cars which constitute a train may be placed in any position desired. Around 225 cars, 450 to 500 tons, is the usual daily output, so that the locomotive and the two young men move close to 500 cars every 10 hours.

At the top of the incline shown in the photograph are the screen house and storage bins, and just across the track from them, as can be best seen in the other photograph, is the hoist and scale house. After a car is weighed, if it is the usual run of stone, it is moved a few feet ahead and a man dumps it into the crusher hoppers. If it happens to be a car of building stone it is moved to the foreground shown in the photograph and dumped to the left on the storage pile.

The hoist, crushing plant and pump in the quarry are all operated by electricity. Two jaw crushers are used. One of them, the original, is a Farrel, made in 1898, measuring 13x30 in., and it has been running practically ever since it was installed. The newer one is a Good Roads Machinery Co. "Champion" and has an opening 10x40 in.

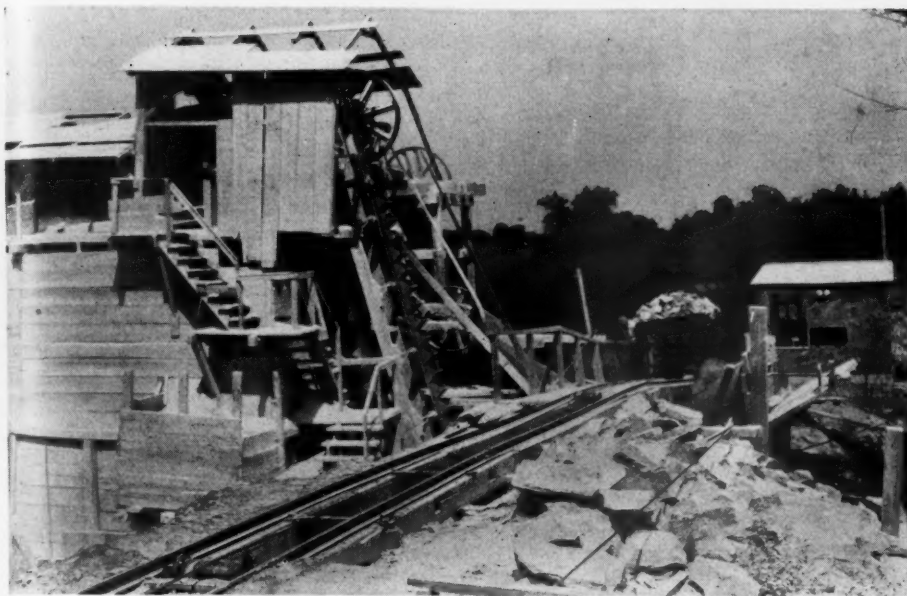
Practically all of the material is sold locally within a radius of 30 miles and delivered by motor trucks. Mr. Jarman for this reason aims to have approximately 1000 tons of each size in stock at all times so that orders may be filled as soon as they



Eight spur tracks now lead into quarry breast



Incline leading from quarry to crusher plant



Track scale at right weighs cars before dumping

are received. A Universal crane with a clamshell bucket is used to load the trucks from the storage piles.

A fleet of 24 Mack trucks is owned by Mr. Johnson and kept busy most of the time delivering stone. Roads leading in all directions from the quarry are excellent, and a round trip of 60 miles is a matter of every-day occurrence. Delivery charges are at the rate of 10c. a ton-mile. Sixteen of the trucks are of 5-ton capacity, half of them with solid tires and half with pneumatics; the other eight of 3½-ton capacity and all of these have pneumatic tires.

Handling Stripping

BEING confronted with the problem of removing considerable overburden for recovery of gravel by dredging, the American Aggregates Corp., Columbus, Ohio, developed an interesting unit for the disposal of stripping.

The unit is a long trough, mounted on an incline and with sides converging toward the lower end. Built of steel, with struc-

tural steel supports, it is mounted on a series of steel, air tight, pontoons.

Across the top of the trough is located a large pipe with regularly spaced discharge holes for water. The water is supplied by a 12-in. pump of 4000 g.p.m. capacity. Water is pumped directly from the river, above the area affected by the overburden discharge.

The operation of this unit is simple. A dragline excavates the overburden and discharges it on to the floating trough, from which it is washed quite a distance into the river by means of the water flow. While the discharge forms bars in the river, they are behind the dredge and do not affect the pumping of gravel. The river is not

navigable and no trouble has been experienced. The flow of the river soon removes the bars, but not before the dredge has moved far enough to be away from the stripped material, thus avoiding possible difficulties that might otherwise arise.

Relocation of the trough is readily accomplished, land lines being moved and the trough pulled manually to a new location. When anchored, land lines to dead men hold it in position.

This is the second unit of its kind used by this company, and the writer was informed they operate very efficiently, and at low cost, considering the depth of overburden.

The accompanying illustration shows the various units and their relation to each other in operation.

Using Separate Float to Support Dredge Intake

AN IMPROVEMENT on the usual boom method of carrying the suction end of a sand and gravel dredge line is the use of a separate float. This float is simply a frame of timbers constructed as shown in the illustration and sufficiently well braced that it will withstand wind and weather to which it may be subjected.



Use of separate float rigidly secured to barge eliminates boom

In the case shown steel oil barrels were used to float the frame. The frame is kept at the right distance from the barge by means of floating braces to each side of the frame. The suction end of the pipe is then attached to the frame with a block and tackle, which is used for raising and lowering the pipe.

The use of this float eliminates the need of a boom, which is frequently a nuisance, and tends to tip one end of the dredge into the water. Moreover it is more flexible than the boom, since the drifting and turning of the dredge will not change the position of the suction when the latter is supported on a separate float instead of on a beam directly attached to the boat as more commonly practiced.



Floating trough provides portable disposal system for stripping at dredging operation

Rock Products Clinic

Sand and Gravel Pumping and Dewatering Problem

A SUBSCRIBER on the other side of the world writes:

"On page 56 of your December 20, 1930, issue there is an article by John Zollinger, of Oakhurst, N. J., touching a phase of operations in handling gravel with which we are unfamiliar.

"We have a proposition before us for pumping fine gravel ($\frac{3}{4}$ -in. to sand) from the seashore in one of our harbors. The proposal is to excavate a basin in a convenient group of rocks and use this as a sump into which the gravel will be scooped by power drag scraper and be pumped thence into a barge mounting a 4-in. pump. The barge would be brought close inshore.

"The point on which we need light relates to the maintaining of the right proportions of solids to water. Can you tell us how this is taken care of in a simple and small rig like this? The flow of gravel into the suction is not likely to be self-regulating. How then can the right ratio be held? May say the work will be carried out at low to mid-tide and in calm weather.

"There is a secondary problem—disposing of the excess water from the barge. We propose to take care of this by leading the pump discharge into a drag conveyor washer on the barge so that the solids delivered to the hopper will be a clean seawater-washed product."

* * * * *

Edmund Shaw's Reply

The inquiry was referred to Edmund Shaw, of Rock Products' staff, who has had much experience with similar problems. Here is Mr. Shaw's reply:

"You ask how the proportion of solids to water in the pump discharge is regulated. In this country it is not usual to use any method of regulation with so small a pump as the 4-in. pump you propose to use. The proportion of solids will vary with the character of the digging. In soft ground, such as the running sand in the beds of rivers, the proportion will sometimes run as high as 30% or even 35% by weight. With hard ground it may be as low as 7%, and if it runs much lower, pumping will not be economical. The ordinary proportion will vary from 15% to 20% as an average, but at any particular minute there may be anything from no solids to 50% in the discharge.

"With larger pumps cutters are used and their use increases every year. Personally, I believe that a cutter should always be used. The cost of installing one is very soon recovered in the saving of power and the greater capacity, due to a higher proportion of solids. Where there are no large pieces

to handle the rotary head cutter is generally used but the traveling screen type will work just as well.

"Dewatering a pump discharge by turning it into a sand drag is new to me but there is no reason why it should not work in your case. With the 10-in. to 18-in. pumps with which I am most familiar such a drag would have to be so large as to be unwieldy, and if there were many large pieces in the gravel it would be apt to break, or at least stop, the drag. But with a 4-in. pump and small material it should work very well. With large pumps heavy-duty dewatering elevators are used as you propose to use the drag.

"I suggest that the drag should have a small compartment into which the pump discharges and that this be connected at the bottom with a settling compartment which has an overflow. The fineness of the sand that would settle would be determined by the area of this settling compartment. I have calculated that if you do not want to save any sand finer than 65-mesh (which has grains of 0.21 mm. dia.) that an area of 1870 sq. in. would do. This is based on a discharge of 1.685 cu. ft. per sec. from the pump, water less solids, and would mean a velocity of about 20 ft. per sec. in the pipe line. This is about as fast as you would care to run it, I think."

* * * * *

Michigan Sand and Gravel Industry Over-Planted

THE EDITOR: I can agree with you that there is an opportunity to do something for the sand and gravel business along the lines you suggest in your editorials in the April 25 and May 9 issues, suggesting a national conference on public works policies. But I will admit that I am a defeatist.

I had the first washed sand and gravel plant in southern Michigan, having been in business about 25 years, and I have seen many meetings where we would try and have some understanding of our competitive problems, but the results never lasted very long.

For years, with the tremendous building going on in Detroit and with hardly plant capacity enough to supply the market, it seemed that the trade generally was always more or less demoralized as compared with other industries.

The losses in the business have been quite large. Ann Arbor is the county seat of Washtenaw county, and there are five plants in the county. I presume the ordinary investment is well up towards seven or eight hundred thousand dollars, and there is not one of them operating at the present time and I question whether any one of them except one will ever start. Two have disappeared.

I would say that there is more money invested in plants, first and last, in Washtenaw county than was ever taken out in sand and gravel. That is, if you take their gross sales, not counting operating expenses at all, it would not equal more than half the money that has been invested.

I have survived but have not had anything in the way of return on the investment that I would have had in almost any other branch of business.

I am well acquainted with all my competitors, and generally speaking I think they are on the average as intelligent as men in any other business, but we never have had competitive conditions that would allow anyone a profit, and I do not expect that we ever will have. I think it is clearly a matter of survival of the fittest.

W. FRANK BRADLEY, President,
Ohio and Michigan Sand and Gravel Co.

* * * * *

High Silica Cements

THE WRITER has read with interest your editorial comment on "Trend in Cement Making," and thanks you for giving him, if he may call it, the honor place in your list, putting it at the head of the enumerated processes.

Your statement, "cement by this process cannot compete in strength with portland cement," is correct as far as the strength in the early stages goes, these cements reaching and over-reaching portland cement strengths at later stages. However, after numerous tests with numerous portland cement clinkers, we have established the fact, that we can modify by our process any portland cements into early strength cements with super qualities. A typical test of such a modification upon a cement shows quite favorable results as is indicated in a copy of Hunt's test which we enclose. We call your attention to the tensile strength, the coarse grinding and the low lime content as the outstanding features of this cement.

Of course this cement will not be included in the portland cement classification, but its outstanding characteristics, we think, will put it into a class by itself and find many applications in the construction world.

E. R. WILNER,
New York. Eddystone Cement Corp.

ROBERT W. HUNT COMPANY, ENGINEERS

| Test of Eddystone early strength cement. | | | | |
|--|-----------------|-------|--------|--|
| Soundness..... | O.K. | | | |
| Initial setting..... | 2 hrs. 20 mins. | | | |
| Final setting..... | 5 hrs. 40 mins. | | | |
| Fineness on 200-mesh sieve..... | 88.90 | | | |
| Normal consistency..... | 27% | | | |
| Tensile strength—1-3 sand briquettes | | | | |
| 24-hour | 3-day | 7-day | 28-day | |
| 285 | 415 | 420 | 500 | |
| 265 | 410 | 430 | 525 | |
| 280 | 390 | 420 | 510 | |
| Averages 276 | 405 | 423 | 511 | |
| Chemical Analysis | | | | |
| Silica | Per cent. | | | |
| Iron oxide | 24.80 | | | |
| Aluminum oxide | 3.99 | | | |
| Calcium oxide | 8.71 | | | |
| Magnesium oxide | 52.10 | | | |
| Loss on ignition..... | 3.19 | | | |
| Sulphuric anhydride | 4.55 | | | |
| Insoluble residue | 2.12 | | | |
| | 0.30 | | | |

Editorial Comment

The Portland Cement Association has followed the example of the lime industry, the motion picture industry, and numerous others, in employing a full-time president. We are sure this is in line with the trend of progress in modern industry, and we believe the P. C. A. is to be congratulated on this progressive step. As we noted at the time that the National Lime Association made a similar decision, it seems entirely the logical thing for an industrial association to do, and for a number of reasons.

As one reason, the duties of president of a great national industrial and business organization such as the P. C. A. are too heavy to impose as a sideline upon any executive who has his own business to look after. Also, as has been said before here, there is much prestige and influence attached to the office, and it ought to accrue to the association itself rather than to a temporary incumbent. Naturally, such prestige can best accrue to the association only where the president is exclusively an employe of the association and more or less a fixture.

Although much has been printed and much more rumored about the present difficulties of the portland cement industry in general and the Portland Cement Association in particular, it has remained throughout the stress of the times perhaps the leading promotional organization in American industry. It has lost some members and lost some income, and possibly some prestige, because of competitive conditions which prohibit profit to many of its members—but it is still a long way ahead of many similar industrial promotional organizations. In any event, no directing head ever came into a trade association organization more firmly established by successful accomplishments than the present P. C. A.

We are constantly confronted with examples of inexcusable waste and inefficiency in political administration of public affairs. Criticism is freely made but in few instances has corrective action been taken to overcome this condition. At no time have the benefits that might result from responsible administration and expenditure of public funds been greater. Construction of many needed improvements could be started if public opinion were directed with sufficient force to end delays resulting from political barter.

Public appreciation of this need is now reflected in a movement by the American Legion through its 10,000 posts to determine needed public work and to promote its immediate construction.

While this action cannot be expected to eliminate inefficient government it can result in immeasurable good through the amount of new construction, with resulting

increased employment in the construction and allied fields, which may be started. And it may result in directing public opinion more effectively toward those responsible for petty bickering and needless delay when action is so essential. Political trading gives employment to no one but the traders themselves.

One of the gratifying results of study and research in the rock products industry is the improved recovery of phosphate rock. It was not so many years ago that the business was wholly confined to "hand mining," a picking out of the better rock from the hollows and crevices of the limestone which underlay the deposits. The coarse rock secured in this way was greatly preferred to the fine, because the fine was contaminated with dirt and clay. Even after washing methods were developed, this preference persisted. The first washing plants were rather crude and the losses in fines did not worry producers so much so long as the precious lumps were clean and free from clay balls. But during and just after the World War, when the price of phosphate rock more than doubled for some grades, there was a great interest in such losses. Settling devices and classifiers were tried and added very considerably to the recovery and to the profits of the operations. Then shaking tables, of the sort that had been so successfully used with metallic ores, were tried and while they were not successful everywhere, in some places they were very successful indeed. They provided the only source of profit in some operations.

Recently patents have been issued for a flotation process that promises to add still more to the percentage of recovery. It has long been known that phosphate rock would float with certain conditions and reagents, but all the ordinary reagents were too expensive for a commercial process. The newer method which uses only soap and fuel oil is cheap enough, even though these have to be used in considerable quantities. The process is not applicable to the "slimes," the very finest phosphate bearing material. In fact, desliming is the first step in the process. But research is still busy with heat and chemical methods and with these there is a possibility that recoveries of phosphate rock may equal those of metallic ores.

The percentage of recovery is of as much importance to the country as a whole as it is to the phosphate rock industry. The earlier reports that said that the phosphate rock resources of the United States were practically unlimited are now discredited. There is none too much of it in localities that lie nearest to where it is most needed. Meanwhile the lands of the United States are growing poorer in phosphate as they are cropped and the time may come when the country will find itself with a great need of phosphate and only depleted deposits to supply it.

The New President of the P. C. A.

Needed Public Works Should Be Built

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

| Stock | Date | Bid | Asked | Dividend | Stock | Date | Bid | Asked | Dividend |
|---|---------|-----------|-------|----------------------|--|---------|--------------|----------------|----------------------|
| Allentown P. C. 1st 6's ²⁷ | 7-27-31 | 94½ | ----- | ----- | Lehigh P. C. | 7-28-31 | 10¼ | 11½ | 25c qu. May 1 |
| Alpha P. C. new com. ² | 7-25-31 | 14 | 16 | 25c qu. July 25 | Lehigh P. C. pfd. | 7-28-31 | 89½ | 95 | 1.75 qu. July 1 |
| Alpha P. C. pfd. ² | 7-25-31 | 110 | 120 | 1.75 qu. June 15 | Louisville Cement ⁴⁵ | 7-28-31 | 175 | 225 | ----- |
| Amalgamated Phosphate | ----- | ----- | ----- | ----- | Lyman-Richey 1st 6's, 1932 ¹³ | 7-24-31 | 95 | ----- | ----- |
| Co. 6's, 1936 ¹⁹ | 7-25-31 | 99 | 102 | ----- | Lyman-Richey 1st 6's, 1935 ¹³ | 7-24-31 | 92 | ----- | ----- |
| American Aggregates com. ¹⁹ | 7-25-31 | 4 | 8 | 75c qu. Mar. 1 | Marblehead Lime 6's ¹⁴ | 7-24-31 | No market | ----- | ----- |
| American Aggregates pfd. ¹⁹ | 7-25-31 | 65 | 75 | 1.75 qu. July 1 | Marbelite Corp. com. | 7-24-31 | 1 | ----- | ----- |
| American Aggr. 6's w.w. | 7-25-31 | 60½ | 65 | ----- | Marbelite Corp. pfd. ³⁰ | 7-23-31 | 17½ | 20½ | 50c qu. Oct. 10, '30 |
| American Aggr. 6's ex. w. ¹⁹ | 7-25-31 | 58½ | 63 | ----- | Material Service Corp. | 7-28-31 | ----- | ----- | 50c qu. June 1 |
| American Brick Co., sand- | ----- | ----- | ----- | ----- | McCready-Rodgers 7% pfd. ²² | 7-23-31 | ----- | ----- | 87½c qu. June 30 |
| lime brick | 5- 4-31 | ----- | 7 | 25c qu. Feb. 1, '30 | McCready-Rodgers com. ²² | 7-23-31 | ----- | 21½ | 75c qu. Jan. 26 |
| American Brick Co. pfd. | 5- 4-31 | 52¼ | 57 | 50c qu. May 1, '30 | Medusa Portland Cement | 7-28-31 | 31 | 37 | 75c qu. Apr. 1 |
| Am. L. & S. 1st 7's ²⁷ | 7-27-31 | 96½ | 98 | ----- | Michigan L. & C. com. ⁹ | 7-25-31 | 45 | ----- | ----- |
| American Silica Corp. 6½'s ³⁹ | 7-29-31 | No market | ----- | ----- | Missouri P. C. | 7-28-31 | 20½ | 21 | 50c qu. July 31 |
| Arundel Corp. new com. | 7-27-31 | 36½ | 36¾ | 75c qu. July 1 | Monolith Portland Midwest ⁹ | 7-23-31 | 1 | 2 | ----- |
| Beaver P. C. 1st 7's ²⁰ | 7-23-31 | 90 | 94 | ----- | Monolith P. C. com. ⁹ | 7-23-31 | 1 | 2 | 40c s.-a. Jan. 1 |
| Bessemer L. & C. Cl. A ⁴ | 7-24-31 | 17½ | 19 | 50c qu. Aug. 1 | Monolith P. C. pfd. ⁹ | 7-23-31 | 2 | 3 | 40c s.-a. Jan. 1 |
| Bessemer L. & C. 1st 6½'s ⁴ | 7-24-31 | 65 | 75 | ----- | Monolith P. C. units ⁹ | 7-23-31 | 5 | 7 | ----- |
| Bloomington Limestone 6's ²⁷ | 7-27-31 | 45 | 47½ | ----- | Monolith P. C. 1st Mtg. 6's ⁹ | 7-23-31 | 73 | 77 | ----- |
| Boston S. & G. new com. ³⁷ | 7-24-31 | 9 | 11 | 15c qu. July 1 | National Cem. (Can.) 1st 7's ³⁴ | 7-24-31 | 101 | ----- | ----- |
| Boston S. & G. new 7% pfd. ³⁷ | 7-24-31 | 36 | 40 | 87½c qu. July 1 | National Gypsum A. com. | 7-28-31 | 3¾ | 4¾ | ----- |
| California Art Tile A ⁹ | 7-23-31 | ----- | 5 | 43¾c Mar. 31 | National Gypsum pfd. | 7-28-31 | 39 | 41 | \$1 Apr. 1 |
| California Art Tile B ⁴⁰ | 7-23-31 | ----- | 3½ | 20c qu. Mar. 31 | Nazareth Cement com. ³⁵ | 7-11-31 | ----- | 12 | ----- |
| Calaveras Cement com. | 7-24-31 | ----- | 5 | ----- | Nazareth Cement pfd. ³⁵ | 7-11-31 | 75 | ----- | ----- |
| Calaveras Cement 7% pfd. | 7-24-31 | ----- | 78 | 1.75 qu. July 15 | Newaygo P. C. 1st 6½'s ²⁷ | 7-27-31 | 98 | 100 | ----- |
| Canada Cement com. | 7-28-31 | 10½ | 10¼ | ----- | New England Lime 6's, 1935 ¹⁹ | 7-25-31 | 40 | 65 | ----- |
| Canada Cement pfd. | 7-28-31 | 87 | ----- | 1.62½ qu. June 30 | N. Y. Trap Rock 1st 6's | 7-24-31 | 94½ | 96 | ----- |
| Canada Cement 5½'s ³⁴ | 7-24-31 | 97¾ | 98½ | ----- | N. Y. Trap Rock 7% pfd. ³⁰ | 7-10-31 | 95 | ----- | 1.75 qu. July 1 |
| Canada Cr. St. Corp. bonds ³⁴ | 7-24-31 | 92 | 97 | ----- | North Amer. Cem. 1st 6½'s | 7-24-31 | 39 | 45 | ----- |
| Canada Crushed Stone com. ⁴¹ | 7-21-31 | ----- | 13 | ----- | North Amer. Cem. com. ²⁷ | 7-27-31 | 1 | 1¾ | ----- |
| Canada Crushed Stone pfd. ⁴¹ | 7-21-31 | ----- | 75 | ----- | North Amer. Cem. 7% pfd. ²⁷ | 7-27-31 | 8 | 12 | ----- |
| Certainated Prod. com. | 7-28-31 | 5¾ | 6 | ----- | North Shore Mat. 1st 5's ¹⁵ | 7-29-31 | 80 | ----- | ----- |
| Certainated Prod. pfd. | 7-28-31 | 25 | 29 | 1.75 qu. Jan. 1 | Northwestern States P. C. ³¹ | 7-27-31 | 95 | 112 | \$2 Apr. 1 |
| Cleveland Quarries | 7-28-31 | ----- | 62 | 75c qu. June 1 | Ohio River Sand com. | 7-28-31 | ----- | 14 | ----- |
| Columbia S. & G. pfd. | 7-27-31 | 86½ | 95 | ----- | Ohio River Sand 7% pfd. | 7-28-31 | ----- | 98 | ----- |
| Consol. Cement 1st 6½'s, A ⁴⁴ | 7-29-31 | 14 | 20 | ----- | Ohio River S. & G. 6's ¹⁶ | 7-24-31 | 85 | 95 | ----- |
| Consol. Cement Notes, 1941 ²⁷ | 7-27-31 | 25 | 30 | ----- | Oregon P. C. com. ⁹ | 7-23-31 | 8 | 12 | ----- |
| Consol. Cement pfd. ²⁷ | 7-27-31 | 20 | 30 | ----- | Oregon P. C. pfd. ⁹ | 7-23-31 | 80 | 85 | ----- |
| Consol. Oka S. & G. 6½'s ¹² | 7-24-31 | 98 | 100 | ----- | Pacific Coast Aggr. com. ¹⁰ | 7-23-31 | ----- | 1 | ----- |
| (Canada) | 7-23-31 | 50c | 75c | ----- | Pacific Coast Aggregates pfd. | 7-27-31 | ----- | 1½ | ----- |
| Consol. Rock Prod. com. ⁹ | 7-23-31 | 4½ | 5 | 43¾c qu. June 1, '30 | Pacific Coast Cement 6's ⁵ | 7-23-31 | 54¼ | 57 | ----- |
| Consol. Rock Prod. pfd. ⁹ | 7-27-31 | ----- | 5½ | ----- | Pacific P. C. com. | 7-24-31 | ----- | 12 | ----- |
| Consol. Rock Prod. units | 7-28-31 | 60 | 70 | 1.75 qu. Aug. 15 | Pacific P. C. pfd. | 7-24-31 | 57 | 65 | 1.62½ qu. July 3 |
| Consol. S. & G. pfd. (Can.) | 7-28-31 | 6 | 9 | ----- | Pacific P. C. 6's ⁵ | 7-23-31 | 99 | ----- | ----- |
| Construction Mat. com. | 7-28-31 | 28 | 29 | 87½c qu. Aug. 1 | Peerless Cement com. ¹ | 7-24-31 | 1½ | 2½ | ----- |
| Construction Mat. pfd. | 7-28-31 | ----- | ----- | ----- | Peerless Cement pfd. | 7-24-31 | 30 | 40 | 1.75 qu. Apr. 1 |
| Consumers Rock & Gravel, | 7-23-31 | 55 | 60 | ----- | Penn.-Dixie Cement com. | 7-28-31 | 11 | 18 | ----- |
| 1st Mtg. 6's, 1948 ³⁵ | 7-27-31 | 40 | 50 | ----- | Penn.-Dixie Cement pfd. | 7-28-31 | 59 act. sale | ----- | ----- |
| Coosa P. C. 1st 6's ²⁷ | 7-25-31 | 55 | 65 | ----- | Penn. Glass Sand Corp. 6's | 7- 8-31 | 98 | 100 | ----- |
| Coplay Cem. Mfg. 1st 6's ¹⁹ | 7-25-31 | 5 | 7½ | ----- | Penn. Glass Sand Corp. pfd. | 7- 8-31 | 90 | ----- | 1.75 qu. July 1 |
| Coplay Cem. Mfg. com. ³³ | 7-25-31 | 25 | 40 | ----- | Potoskey P. C. | 7-28-31 | ----- | 5 | 15c qu. Apr. 1 |
| Coplay Cem. Mfg. pfd. ³³ | 7-25-31 | 38 | 42 | \$1 qu. July 1 | Port Stockton Cem. com. ⁹ | 7-23-31 | No market | ----- | ----- |
| Dolese & Shepard | 7-28-31 | 6 | 7 | 1.75 qu. July 2 | Riverside Cement com. | 7-24-31 | 9 | 13 | ----- |
| Dufferin Pav. & Cr. Stone com. | 7-28-31 | ----- | ----- | ----- | Riverside Cement pfd. ²⁰ | 7-23-31 | 58 | 60 | 1.50 qu. Aug. 1 |
| Dufferin Pav. & Cr. Stone pfd. | 7-28-31 | ----- | ----- | ----- | Riverside Cement, A ²⁰ | 7-23-31 | 15 | 15c qu. Feb. 1 | ----- |
| Edison P. C. com. ³² | 7-10-31 | 1½ | ----- | ----- | Riverside Cement, B ²⁰ | 7-23-31 | 75c | 1 | ----- |
| Edison P. C. pfd. ³² | 7-10-31 | 5 | ----- | ----- | Roquemore Gravel 6½'s ¹⁷ | 7-24-31 | 98 | 100 | ----- |
| Federal P. C. 6½'s, 1941 ¹⁰ | 7-25-31 | 96 | 100 | ----- | Sandusky Cement 6½'s, | 7-25-31 | 90 | 100 | ----- |
| Giant P. C. com. ² | 7-25-31 | 2 | 5 | ----- | 1931-37 ¹⁰ | 7-24-31 | 84 | ----- | \$1 qu. July 1 |
| Giant P. C. pfd. ² | 7-25-31 | 13 | 18 | 1.75 s.-a. Dec. 15 | Santa Cruz P. C. com. | 7-24-31 | 6½ | 11 | 25c qu. June 27 |
| Gyp. Lime & Alabastine, Ltd. | 7-28-31 | 7½ | 8 | 20c qu. June 30 | Schumacher Wallboard com. | 7-24-31 | 14 | 22 | 50c qu. Aug. 15 |
| Hermitage Cement com. ¹¹ | 7-25-31 | 15 | 25 | ----- | Schumacher Wallboard pfd. | 7-24-31 | 235 | 275 | ----- |
| Hermitage Cement pfd. ¹¹ | 7-25-31 | 70 | 80 | ----- | Standard Paving & Mat. | 7-23-31 | ----- | ----- | ----- |
| Ideal Cement, new com. | 7-28-31 | 31½ | 33½ | 75c qu. July 1 | (Canada) com. | 7-28-31 | 6¾ | 6½ | 50c qu. May 15 |
| Ideal Cement 5's, 1943 ²⁹ | 7-11-31 | 99 | 101 | ----- | Standard Paving & Mat. pfd. | 7-28-31 | 70 | 71 | 1.75 qu. Aug. 15 |
| Illinois Electric Limestone | 7-23-31 | 95 | 98½ | ----- | Superior P. C., A. | 7-24-31 | 36 | 40 | 27½c mo. Aug. 1 |
| 1st 7's ²⁸ | 7-27-31 | ----- | 2 | ----- | Superior P. C., B. | 7-24-31 | 9½ | 13 | 25c qu. Mar. 20 |
| Indiana Limestone com. ²⁷ | 7-27-31 | ----- | 40 | ----- | Trinity P. C. units ³¹ | 7-27-31 | 98 | ----- | ----- |
| Indiana Limestone pfd. ²⁷ | 7-24-31 | 25 | 28 | ----- | Trinity P. C. com. ³¹ | 7-27-31 | 17 | 25 | ----- |
| Indiana Limestone 6's | 7-28-31 | 31 | 32½ | \$1 qu. June 30 | Trinity P. C. pfd. ²⁷ | 7-27-31 | 90 | ----- | ----- |
| International Cem. com. | 7-28-31 | 86 | 87 | Semi-ann. int. | U. S. Gypsum com. | 7-28-31 | 35¼ | 36½ | 40c qu. June 30 |
| International Cem. bonds 5's | 6-26-31 | 80 | 90 | ----- | U. S. Gypsum pfd. | 7-28-31 | 128¼ | 133 | 1.75 qu. June 30 |
| Iron City S. & G. bonds 6's ³⁶ | 7-28-31 | ----- | 27 | 50c qu. July 1 | Wabash P. C. ²¹ | 7-25-31 | ----- | 21 | ----- |
| Kelley Is. L. & T. new stock | 7-23-31 | 2 | 3 | ----- | Warner Co. com. ¹⁶ | 7-24-31 | 23½ | 24 | 25c qu. July 15 |
| Ky. Cons. St. V. T. C. ³⁸ | 7-23-31 | 70 | 75 | ----- | Warner Co. 1st 7% pfd. ¹⁶ | 7-24-31 | 90 | 95 | 1.75 qu. July 1 |
| Ky. Cons. Stone 6½'s ³⁸ | 7-23-31 | 2 | 3 | ----- | Warner Co. 1st 6's | 7-28-31 | 86 act. sale | ----- | ----- |
| Ky. Cons. Stone com. ³⁸ | 7-23-31 | 65 | ----- | 1.75 qu. May 1 | Whitehall Cem. Mfg. com. ³⁰ | 7-10-31 | 80 | ----- | ----- |
| Ky. Cons. Stone pfd. ³⁸ | 7-25-31 | 4½ | 5½ | 40c qu. Oct. 1, '30 | Whitehall Cem. Mfg. pfd. ³⁰ | 7-10-31 | 50 | ----- | ----- |
| Ky. Rock Asphalt com. ¹¹ | 7-25-31 | 75 | 80 | 1.75 qu. June 1 | Wisconsin L. & C. 1st 6's ¹⁵ | 7-29-31 | 80 | ----- | ----- |
| Ky. Rock Asphalt pfd. ¹¹ | 7-25-31 | 85 | 90 | ----- | Wolverine P. C. com. | 7-28-31 | 1½ | 3 | 15c qu. Nov. 15 |
| Lawrence P. C. | 7-27-31 | 39 | 44 | \$1 qu. June 30 | Yosemite P. C., A. com. ⁹ | 7-23-31 | ----- | 10 | ----- |
| Lawrence P. C. 5½'s, 1942 ²² | 7-25-31 | 80 | 85 | ----- | ----- | ----- | ----- | ----- | ----- |

Quotations by: ¹Watling Lerchen & Hayes Co., Detroit, Mich. ²Bristol & Willett, New York. ³Rogers, Tracy Co., Chicago. ⁴Butler, Beadling & Co., Youngstown, Ohio. ⁵Smith, Camp & Riley, San Francisco, Calif. ⁶Frederick H. Hatch & Co., New York. ⁷J. J. B. Hilliard & Son, Louisville, Ky. ⁸Dillon, Read & Co., Chicago, Ill. ⁹A. E. White Co., San Francisco, Calif. ¹⁰Lee Higginson & Co., Boston and Chicago. ¹¹J. W. Jakes & Co., Nashville, Tenn. ¹²James Richardson & Sons, Ltd., Winnipeg, Man. ¹³Stern Bros. & Co., Kansas City, Mo. ¹⁴First Wisconsin Co., Milwaukee, Wis. ¹⁵Central Trust Co. of Illinois. ¹⁶J. S. Wilson, Jr., Co., Baltimore, Md. ¹⁷Citizens Southern Co., Savannah, Ga. ¹⁸Dean, Witter & Co., Los Angeles, Calif. ¹⁹Hewitt, Ladin & Co., New York. ²⁰Tucker, Hunter, Dulin & Co., San Francisco, Calif. ²¹Baker, Simonds & Co., Inc., Detroit, Mich. ²²Peoples-Pittsburgh Trust Co., Pitts-

burgh, Penn. ²³A. B. Leach & Co., Inc., Chicago, Ill. ²⁴Richards & Co., Philadelphia, Penn. ²⁵Hicks Bros. & Co., Bridgeport, Conn. ²⁶Bank of Republic, Chicago, Ill. ²⁷National City Co., Chicago, Ill. ²⁸Chicago Trust Co., Chicago, Ill. ²⁹Boettcher & Co., Denver, Colo. ³⁰Hanson and Hanson, New York. ³¹S. F. Holzinger & Co., Milwaukee, Wis. ³²Tobey and Kirk, New York. ³³Steiner, Rouse and Co., New York. ³⁴Jones, Heward & Co., Montreal, Que. ³⁵Tenney, Williams & Co., Los Angeles, Calif. ³⁶Stein Bros. & Boyce, Baltimore, Md. ³⁷Wise, Hobbs & Arnold, Boston. ³⁸E. W. Hays & Co., Louisville, Ky. ³⁹Blythe Witter & Co., Chicago, Ill. ⁴⁰Martin Judge & Co., San Francisco, Calif. ⁴¹A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. ⁴²Nesbitt, Thomas & Co., Montreal. ⁴³H. H. Rollins, Chicago. ⁴⁴Dunlap, Wakefield & Co., Louisville, Ky.

Consolidated Rock Products Co.'s Annual Statement

THE Consolidated Rock Products Co., Los Angeles, Calif., reports a balance sheet for the year ended December 31, 1930, as follows:

| | |
|----------------------------|--------------|
| Net sales | \$ 4,331,488 |
| Cost of sales and expenses | 3,704,817 |
| Depreciation | 950,295 |
| Operating loss | 323,624 |
| Other income | 23,107 |
| Loss | 300,517 |
| Bond interest | 225,175 |
| Amortization, etc. | 94,567 |
| Net loss | 620,259 |
| Dividends | 262,500 |

Deficit.....\$ 882,759

CONSOLIDATED BALANCE SHEET AS OF DECEMBER 31, 1930

| ASSETS | |
|---|--------------|
| Property account (after depreciation and depletion) | \$13,371,546 |
| Invested in controlled company | 53,778 |
| Current assets: | |
| Cash | 188,755 |
| Accounts and notes receivable (net) | 523,082 |
| Inventories | 121,284 |
| Bonds of subsidiaries | 55,700 |
| Other assets | 355,615 |
| Prepaid items | 140,084 |
| Total | \$14,809,844 |

| LIABILITIES | |
|---|--------------|
| Preferred stock (300,000 no par shares) | \$7,500,000 |
| Common stock (397,455 no par shares) | 794,910 |
| Funded debt | 3,637,000 |
| Current liabilities: | |
| Accounts payable and accruals | 356,259 |
| Bank loans | 100,000 |
| Notes and contracts payable | 253,090 |
| Other notes and contracts payable | 76,511 |
| Minority interest | 503 |
| Surplus | 2,091,571 |
| Total | \$14,809,844 |

| | |
|---------------------|------------|
| Current assets | \$ 833,121 |
| Current liabilities | 709,349 |

Working capital.....\$ 123,772

Ross Island Sand and Gravel Co. Balance Sheet

THE Ross Island Sand and Gravel Co., Portland, Ore., reports a balance sheet as of December 31, 1930, as follows:

| ASSETS | | 1930 | 1929 |
|----------------------------------|-------------|-------------|------|
| Property account (less reserves) | \$1,687,748 | \$1,724,635 | |
| Special deposits | 17,786 | 18,839 | |
| Depletion installment | 2,581 | | |
| Contract receivable | | 8,195 | |
| Investments | 919,570 | 919,571 | |
| Current assets: | | | |
| Cash | 17,917 | 22,925 | |
| Notes and accounts receivable | 41,973 | 32,942 | |
| Inventories | 34,958 | 34,792 | |
| Equipment for sale | 1,645 | | |
| Due from R. H. Schnuloch | 17,090 | 17,090 | |
| Deferred debits | 78,657 | 88,512 | |
| Total | \$2,818,280 | \$2,869,146 | |

| LIABILITIES | | 1930 | 1929 |
|------------------------------|-------------|-------------|------|
| Preferred stock | \$ 636,170 | \$ 636,179 | |
| *Common stock and surplus | 1,537,436 | 1,568,787 | |
| Funded debt | 503,600 | 514,800 | |
| Current liabilities: | | | |
| Notes and accounts payable | 29,115 | 36,964 | |
| Deposits payable | 2,581 | | |
| Taxes payable | 262 | | |
| Salaries and wages payable | 1,630 | 1,834 | |
| Interest payable and accrued | 17,748 | 18,316 | |
| Accruals | 13,393 | 16,224 | |
| Due others | 46,445 | 39,261 | |
| Contracts payable | 10,175 | | |
| Assessment payable | 1,829 | 2,032 | |
| B. P. C. Co. account | 17,896 | 21,843 | |
| Contract—to be liquidated | | 8,693 | |
| Deposit on purchase contract | | 1,250 | |
| Contingency reserve | | 2,971 | |
| Total | \$2,818,280 | \$2,869,146 | |

| | | |
|---------------------|-----------|-----------|
| Current assets | \$ 94,848 | \$ 92,304 |
| Current liabilities | 111,174 | 112,599 |

Working capital.....†\$16,326 †\$20,295

*Represented by 29,494 no par shares. †Deficit.

Oregon Portland Cement Co. Earnings

THE TOTAL VOLUME of cement sales in Oregon for three years, as compiled by L. C. Newlands, vice-president of the Oregon Portland Cement Co., in his report to stockholders, were:

| | Bbl. |
|------------------|-----------|
| 1928 | 1,243,254 |
| 1929 | 1,050,000 |
| 1930 (estimated) | 1,065,903 |

For the past three years sales of the company were as follows:

| | Bbl. |
|------|---------|
| 1928 | 538,000 |
| 1929 | 542,611 |
| 1930 | 610,064 |

Thus it appears that while total cement sales in Oregon for 1930 were but 1.5% greater than 1929 sales, the Oregon Portland Cement Co.'s sales volume increased more than 12%.

From company's 1930 balance sheet these facts stand out: Company's cash as of December 31, \$57,815, was more than \$14,000 in excess of total current liabilities, which were \$33,411; working capital was \$531,955, the difference between current assets of \$565,366 and current liabilities of \$33,411; ratio of quick assets to current liabilities was about 16.9 to 1; the company has no funded or long term debt; during 1930 the company purchased in open market and retired \$24,200 of its own 7% cumulative preferred stock, against retirement (of merger between Sun and Oregon companies) that 2% of this stock be retired annually, which would have been about \$20,700; during 1930 \$1 annual dividend on company's common stock (no par value) was maintained.

Peerless Cement Corp. Balance Sheet

THE Peerless Cement Corp., Detroit, Mich., reports a balance sheet as of December 31, 1930, as follows:

| ASSETS | | December 31, 1930 | January 1, 1930 |
|-------------------------------------|-------------|-------------------|-----------------|
| Land, buildings, equipment | \$6,546,841 | \$6,989,612 | |
| Investments | 190,122 | 89,434 | |
| Current assets: | | | |
| Cash | 58,505 | 181,173 | |
| Notes and accounts receivable (net) | 259,782 | 133,543 | |
| Inventories | 1,560,821 | 1,377,392 | |
| Special accounts | 5,077 | 16,800 | |
| Sinking fund | 5,500 | | |
| Prepaid items | 56,775 | 66,048 | |
| Bond discount and expenses | 139,109 | 176,443 | |
| Deferred charges | 11,490 | 7,208 | |
| Total | \$8,834,023 | \$9,037,653 | |

| LIABILITIES | | 1930 | 1929 |
|----------------------|-------------|-------------|------|
| Preferred stock | \$ 440,500 | \$ 474,800 | |
| †Common stock | 5,962,982 | 5,962,983 | |
| Funded debt | 1,707,000 | 1,920,500 | |
| Other long-term debt | 156,883 | 234,713 | |
| Current liabilities: | | | |
| Notes payable | 260,000 | | |
| Accruals | 31,853 | 58,529 | |
| Accounts payable | 95,038 | 254,092 | |
| Surplus | 179,767 | 132,036 | |
| Total | \$8,834,023 | \$9,037,653 | |

| | | |
|---------------------|-------------|-------------|
| Current assets | \$1,884,185 | \$1,708,908 |
| Current liabilities | 386,891 | 312,622 |

Working capital.....\$1,497,294 \$1,396,286

†Represented by 238,854 no par shares.

Construction Materials Corp.'s Annual Statement

THE Construction Materials Corp., Chicago, Ill., sand and gravel producer and dredging contractor, reports for the years ending December 31:

| | 1930 | 1929 |
|----------------------------|-------------|-------------|
| Gross profit | \$1,102,468 | \$1,660,446 |
| Depreciation and depletion | 135,403 | 126,275 |
| Selling and other expenses | 501,950 | 452,326 |
| Federal tax provision | 50,261 | 120,000 |

| | | |
|------------------------|------------|------------|
| Net profit for year | \$ 414,854 | \$ 961,845 |
| Previous surplus | 2,060,161 | 1,246,356 |
| Appreciation of land | | 299,627 |
| Appreciation on vessel | 160,579 | |

| | | |
|---|-------------|-------------|
| Total surplus | \$2,635,594 | \$2,507,828 |
| Dividends paid and accrued | 262,505 | 226,044 |
| Reorganization expense | 4,100 | 71,623 |
| Provision for contingencies | | 150,000 |
| Adjustment of land account appreciation | 228,599 | |
| Charges incidental to new financing | 352,083 | |
| Prior year charges | 94,985 | |

| | | |
|--|-------------|-------------|
| Surplus December 31 | \$1,693,321 | \$2,060,161 |
| Earnings per share on 185,000 shares common stock (no par) | \$0.82 | \$3.98 |

CONSOLIDATED BALANCE SHEET DECEMBER 31, 1930

[Adjusted to give effect to the following transactions subsequently consummated: (a) Sale of preferred stock in Moulding-Brownell Corp. for secured note; (b) organization of a wholly owned subsidiary, the Sensibar Transportation Co., and transfer to it of certain assets in exchange for its capital stock and \$1,650,000 bonds; (c) sale of bonds thus acquired and \$1,500,000 two-year 6% notes and application of a portion of the proceeds in liquidation of certain indebtedness.]

| ASSETS | | 1930 |
|--|--------------|------|
| Cash, including proceeds from this financing not otherwise applied | \$ 721,296 | |
| Accounts receivable, including Moulding-Brownell Corp. | 455,728 | |
| Retainer certificates | 106,768 | |
| Inventories | 137,541 | |
| Cash value of insurance | 29,680 | |
| Note receivable (secured) | 526,695 | |
| Investment in Moulding-Brownell Corp. (66,750 shares common) at cost | 322,393 | |
| Miscellaneous non-current accounts receivable | 303,447 | |
| Sand and gravel deposits | 783,815 | |
| Vessels | 3,512,245 | |
| Lands, buildings, machinery, etc. | 2,483,608 | |
| Cash and notes reserved for completion of Ferrysburg plant | 850,000 | |
| Good will | 1 | |
| Deferred charges | 102,809 | |
| Total | \$10,336,031 | |

| LIABILITIES | | |
|---|--------------|--|
| Accounts payable | \$ 462,360 | |
| Accrued liabilities | 130,350 | |
| Two-year 6% notes | 1,500,000 | |
| First mortgage marine equipment | 1,650,000 | |
| Purchase money mortgages on vessels, due serially to 1941 | 450,000 | |
| Reserve for contingencies | 150,000 | |
| Preference stock | 3,375,000 | |
| Common stock | *925,000 | |
| Surplus | 1,693,321 | |
| Total | \$10,336,031 | |

*Represented by 185,000 shares no par value.

Recent Dividends Announced

| | |
|--|--------------------|
| Bessemer Limestone and Cement Cl. A. (qu.) | \$0.50, Aug. 1 |
| Consolidated Sand and Gravel pfd. (Can.) (qu.) | 1.75, Aug. 15 |
| Limestone Products 7% pfd. (qu.) | 0.62½, Oct. 1 |
| Limestone Products 7% pfd. (qu.) | 0.62½, Jan. 1, '32 |
| Limestone Products 7% pfd. (qu.) | 0.62½, Apr. 1, '32 |
| Standard Paving and Materials pfd. (qu.) | 1.75, Aug. 15 |

Traffic and Transportation

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of July 25:

CENTRAL FREIGHT ASSOCIATION DOCKET

29055. To establish on crushed stone and screenings, carloads, Monon, Ind., to Roselawn, Ind., 60c per net ton, to expire December 31, 1931. Present rate, 70c.

TEXAS-LOUISIANA TARIFF BUREAU DOCKET

S-8168. Sand and gravel, carloads, from Sledge and Joyce, Tex., to Texarkana: Proposition from carriers to establish rate of \$15 per car when not loaded in excess of marked capacity of cars, cars loaded in excess of marked capacity, the charge per ton for excess loading shall be in proportion to the charge per ton under the per car charge as prescribed above. Will not apply as basing rates nor in dividing through rates. Switching charges of other lines at Texarkana will be added to the proposed rate. Proposed rate to meet truck competition.

SOUTHWESTERN FREIGHT BUREAU DOCKET

23310. Phosphate rock, from New Orleans and Lake Charles, La., to Texarkana, Ark.-Tex., etc. To establish a rate of 17c per 100 lb. on phosphate rock, crude, ground or pulverized, carloads, minimum weight 80,000 lb., from New Orleans and Lake Charles, La. (shipside), to Texarkana, Ark.-Tex., and intermediate points in Arkansas and Louisiana on the Missouri Pacific R. R. and T. & P. Ry. Under Texas-Louisiana Tariff Bureau record, coastwise rate of 17c per 100 lb. is being published on phosphate rock, crude, ground or pulverized, minimum weight 80,000 lb., from New Orleans and Lake Charles, shipside, to Texarkana, Ark.-Tex. It is the desire of the Missouri Pacific R. R. to apply this rate from both ports via Missouri Pacific direct; also from New Orleans via T. & P., Alexandria, and Missouri Pacific.

23328. Asphalt rock, etc., from Oklahoma points to points in Arkansas, Kansas, Louisiana, Missouri, Oklahoma and Texas. To establish the following distance scale of rates on asphalt rock, natural or coated with not to exceed 5% of road oil, crushed or ground, and on stone coated with not to exceed 5% of road oil, crushed or ground, in straight or mixed carloads, coming within the description of crude or raw material which has to be further processed at destination to become a finished paving material, minimum weight 90% of the marked capacity of the car, except that when the car is loaded to full visible capacity the actual weight shall govern, from Ardmore, Bratcher, Dougherty and all other Oklahoma shipping points to destinations in Arkansas, Kansas, Louisiana west of the Mississippi river, Missouri, Oklahoma and Texas, to be effective concurrently with the publication of rates from Texas shipping points, all existing rates to and from points named above to be canceled and the distance scale to be given uniform application from all Oklahoma shipping points to the destinations named above (rates in cents per net ton):

| Miles | Single | Joint | Miles | Single | Joint |
|-------------|--------|-------|------------|--------|-------|
| 10 and less | 70 | 90 | 260 to 275 | 220 | 230 |
| 10 to 20 | 80 | 100 | 275 to 290 | 220 | 230 |
| 20 to 30 | 90 | 110 | 290 to 300 | 230 | 235 |
| 30 to 40 | 100 | 120 | 300 to 320 | 230 | 235 |
| 40 to 50 | 105 | 125 | 320 to 325 | 235 | 245 |
| 50 to 60 | 110 | 130 | 325 to 350 | 235 | 245 |
| 60 to 70 | 115 | 135 | 350 to 380 | 245 | 250 |
| 70 to 75 | 120 | 140 | 380 to 400 | 255 | 260 |
| 75 to 80 | 120 | 140 | 400 to 410 | 255 | 260 |
| 80 to 90 | 125 | 145 | 410 to 440 | 265 | 270 |
| 90 to 100 | 130 | 150 | 440 to 450 | 275 | 280 |
| 100 to 110 | 135 | 155 | 450 to 470 | 275 | 280 |
| 110 to 120 | 140 | 160 | 470 to 500 | 285 | 285 |
| 120 to 130 | 145 | 165 | 500 to 530 | 290 | 290 |
| 130 to 140 | 150 | 170 | 530 to 550 | 300 | 300 |
| 140 to 150 | 155 | 175 | 550 to 560 | 300 | 300 |
| 150 to 160 | 160 | 180 | 560 to 590 | 310 | 310 |
| 160 to 170 | 165 | 185 | 590 to 600 | 320 | 320 |
| 170 to 175 | 170 | 190 | 600 to 620 | 320 | 320 |
| 175 to 180 | 170 | 190 | 620 to 650 | 330 | 330 |
| 180 to 190 | 175 | 195 | 650 to 680 | 340 | 340 |
| 190 to 200 | 180 | 200 | 680 to 710 | 350 | 350 |
| 200 to 225 | 200 | 210 | 710 to 740 | 360 | 360 |
| 225 to 230 | 200 | 210 | 740 to 770 | 370 | 370 |
| 230 to 250 | 210 | 220 | 770 to 800 | 380 | 380 |
| 250 to 260 | 210 | 220 | | | |

Proponent states that as the Interstate Commerce Commission, under Docket 23094, has prescribed a distance scale of rates from Texas shipping points to points in the Southwest which the carriers themselves advocated and which same scale has been prescribed for application between points in Texas on intrastate traffic, as per Railroad Commission of Texas Circular 8825, dated June 29, 1931, there is no reason why the same scale should not apply from Oklahoma shipping points to the same destination territory to which the scale has been prescribed for application from Texas shipping points.

I. C. C. Decisions

21492. Cement. In a report written by Commissioner Aitchison, the Interstate Commerce Commission in Dewey Portland Cement Co. vs. A. & E. et al., and cases joined with it, deals with rates on cement from Linwood, Ia., in relation to rates on that commodity from LaSalle, Oglesby and Dixon, Ill., and from Ilasco and Marquette, Mo. The report also embraces No. 21500, Dewey Portland Cement Co. vs. A. & W. et al.; No. 21604, Same vs. A. T. & S. F. et al.; No. 21635, Same vs. C. B. & Q. et al.; No. 21661, Same vs. C. R. I. & P. et al.; No. 21682, Same vs. C. M. St. P. & P. et al., and No. 21977, Same vs. A. T. & S. F. et al. Orders in these cases require the carriers to revise rates on cement not later than October 21.

The commission found that the rates asailed from Linwood were not unreasonable except that those from that point to destinations in Missouri in Scale III territory on and north of the Frisco from St. Louis to Pacific, Mo., the Missouri Pacific thence to Labadie, Mo., and the Rock Island thence to Kansas City, Mo., and to destinations in Missouri on and east of the Frisco from St. Louis to Horine, Mo., the Missouri Pacific thence to Delta, Mo., and the Frisco thence to Cape Girardeau, Mo. It says they are and for the future will be unreasonable to the extent they exceed or may exceed rates based on Scale II and to other destinations in the so-called "no-scale" territory in Missouri to the extent they exceed or may exceed rates based on Scale III, distances to be computed under the rules laid down in the supplemental report in Western Cement Rates, 52 I. C. C. 225, and as set forth in the appendix to Iowa Cement Mills Traffic Association vs. A. W., 87 I. C. C. 451.

The commission found that the relationship as between intrastate rates on cement, from LaSalle, Oglesby and Dixon, Ill., on the one hand, and the interstate rates on like traffic from Linwood to Chicago, Ill., resulted in undue preference of cement manufacturers at LaSalle, Oglesby and Dixon, and of intrastate traffic from those points and in undue prejudice to the complainant and interstate traffic from Linwood.

After finding that the circumstances and conditions surrounding the transportation of cement, interstate, from Linwood and intrastate from LaSalle, Oglesby and Dixon to points in Illinois and the Chicago switching district were substantially similar, the commission said that the relationship as between the intrastate rates and the interstate rates to points of delivery in the Chicago district to which the rate from the Illinois mills was 8c was and for the future would be unduly preferential of the Illinois cement producing points and unduly prejudicial to Linwood, to the extent that the rate from Linwood was

or might be on a higher or different basis, distance considered, than the rates contemporaneously maintained from the Illinois cement producing points to the Chicago district. The commission said that the undue preference and prejudice might be removed by the establishment of a rate from Linwood to the Chicago district in Illinois the same amount below the so-called No. 12710 scale prescribed in Atlas Portland Cement Co. vs. C. B. & Q., 81 I. C. C. 1, as the rate from the Illinois cement producing points was less than the scale rate from LaSalle to those points and subject to the same minimum as that contemporaneously maintained from the Illinois producing points to the points of delivery in the Chicago district.

No order would be entered, said the commission, but complainant might bring the matter to its attention if the undue prejudice and preference found were not removed within 60 days from the service of this report. The commission said that the removal of the undue prejudice and preference with respect to these rates would operate to satisfy the complaint against the relationship between the rate from Linwood and the rate from Buffington, Ind., to Chicago.

The commission found further that the circumstances and conditions surrounding the transportation of cement from Linwood and LaSalle, Oglesby and Ilasco, Mo., and Mason City, Ia., to Wausau, Wis., were substantially similar; that Scale II rates were and would be maximum reasonable ones from and to those points; that the relationship as between the rates from Linwood, on the one hand, and from LaSalle, Oglesby, Ilasco and Mason City, on the other, to Wausau, to the extent that the rates from LaSalle, Oglesby, Ilasco and Mason City were lower, distance considered, or on lower or different levels, distance considered, than the rate from Linwood to Wausau, resulted and would result in undue prejudice and disadvantage to Linwood and in undue preference of LaSalle, Oglesby, Ilasco and Mason City, and that such preference and prejudice might be removed by the establishment of rates based on Scale II.

A still further finding was that the circumstances and conditions surrounding transportation from Linwood to St. Louis, Mo., were substantially similar to those surrounding the intrastate transportation from Ilasco to St. Louis; to destinations in Missouri on and east of the lines of the St. Louis and Hannibal from Hannibal to Gilmore, and of the Wabash to, but not including St. Louis, substantially similar to those surrounding the intrastate transportation from Ilasco, Prospect Hill and Alpha to the same destinations, except from Ilasco to Hannibal; to destinations in Missouri on and east of the lines of the Frisco from St. Louis to Horine, of the Missouri Pacific to Delta, and of the Frisco to Cape Girardeau, substantially similar to those surrounding intrastate transportation from Marquette to the same destinations, except to Cape Girardeau; and to Riverside and Horine substantially similar to those surrounding intrastate transportation from Prospect Hill and Alpha to the same destinations; that the relationship as between the intrastate rates on this commodity from Ilasco, Prospect Hill, Alpha and Marquette, on the one hand, and the interstate rates on like traffic from Linwood, on the other, to

those destinations, resulted in undue preference and advantage of manufacturers at Ilasco, Prospect Hill, Alpha and Marquette, and undue prejudice to interstate traffic from Linwood to the extent that the rates to those destinations from the Missouri cement producing points were lower, distance considered, than the rates from Linwood; and that such undue prejudice and preference could and should be removed by the establishment of rates from Linwood which should bear the same relationship to the rates from the Missouri mills as would obtain if the rates from all of these mills were based on the No. 12710 scale to St. Louis and destinations north of that point and on Scale II to destinations south of St. Louis.

A further finding was that the circumstances and conditions surrounding transportation from Linwood to St. Louis were more favorable than those attending transportation, intrastate, from Marquette to St. Louis, that the relationship as between the intrastate rate from Marquette, on the one hand, and the interstate rate from Linwood on the other, to St. Louis, resulted in undue preference of Marquette, and that the preference and prejudice could and should be removed by the establishment of rates from Linwood which should bear the same relationship to the rates from Marquette as should obtain if the rates were based on the No. 12710 scale from Linwood and Scale II from Marquette.

A final finding was that the circumstances and conditions surrounding transportation from Linwood to destinations in Missouri in Scale II and Scale III territories and in "no-scale" territory west of the lines of the Frisco from St. Louis to Horine, of the Missouri Pacific to Delta, and the Frisco to Cape Girardeau, were substantially similar to those surrounding intrastate transportation from Ilasco, Prospect Hill, Alpha, Marquette and Sugar Creek to the same destinations, except from Sugar Creek to Kansas City; that reasonable maximum rates were and would be Scale II rates to destinations in Scale II territory and in that part of Scale III territory on and north of the Frisco from St. Louis to Pacific, the Missouri Pacific, thence to Labadie, and the Rock Island to Kansas City, and Scale III rates to other destinations in Scale III territory and destinations in the before described part of "no-scale" territory; that the intrastate rates on this commodity, to the extent that they were lower, on lower or different levels, distance considered, than the rates from Linwood to the same destinations, resulted and would result in undue preference and advantage to Ilasco, Prospect Hill, Alpha, Marquette and Sugar Creek, and of interstate traffic from those points to the disadvantage of Linwood.

The commission said that the prejudice and preference should be removed by the establishment of the rates from Linwood and the Missouri cement manufacturing points to destinations in Scale II territory in the before described part of Scale III territory based on Scale II, and to other destinations in Scale III territory and destinations in the before described part of "no-scale" territory based on Scale III.

The complaint Nos. 21604, 21661, 21682 and 21977 were dismissed.

Georgia Protests Revised Road Aggregate Rates

THE GEORGIA Public Service Commission has filed with the Interstate Commerce Commission a petition to proceed against the Atlantic Coast Line railroad and other carriers for publishing certain rates on

sand, gravel and crushed stone, or to revoke a previous order of the Federal Trade Commission so that the State Commission may take action.

The matter presents, according to Mr. Perry, chairman of the State Commission, "a very peculiar and interesting question in regard to the authority of the Interstate Commerce Commission to deal with intrastate rates." The statement follows in full:

The Georgia Public Service Commission has filed a petition with the Interstate Commerce Commission to proceed against the Atlantic Coast Line railroad and several other Georgia carriers for violating orders of the Interstate Commerce Commission in publishing rates on sand, gravel and crushed stone or to revoke orders of the Interstate Commerce Commission now outstanding so that the Georgia Commission may proceed against these carriers for violation of orders of the Georgia Commission.

In March, 1928, the Georgia Public Service Commission revised the rates on sand, gravel, crushed stone and other like road building materials and prescribed the same rate for a given distance without regard to whether the traffic was handled over one or more railroads. The effect of the rates prescribed by the Georgia Commission was to place all shippers on a parity for an equal distance.

This order was attacked by the railroads before the Interstate Commerce Commission on the grounds that the rates prescribed by the Georgia Commission were too low and caused discrimination against interstate commerce and after hearings lasting over a period of several days the Interstate Commerce Commission issued an order under section 13 of the Interstate Commerce Act requiring the railroads to disregard the orders of the Georgia Commission and to apply rates prescribed by the Interstate Commerce Commission which provided for higher rates where the traffic was moved over more than one railroad than when the traffic was moved over only one railroad.

This order of the Interstate Commerce Commission resulted in distinct advantages to the shippers in other states and a discrimination against Georgia shippers, and the Georgia Commission contested the order of the Interstate Commerce Commission through the courts. The United States court held that the order of the Interstate Commerce Commission was not illegal, although the court made no finding as to the merits of the method employed by either the Georgia Commission or the Interstate Commerce Commission in constructing the rates.

The order of the Interstate Commerce Commission has resulted in great losses to the shippers of Georgia as well as losses to some of the Georgia carriers, and effective July 14 the Atlantic Coast Line railroad and several other railroads in Georgia have disregarded the orders of the Interstate Commerce Commission and also the orders of the Georgia Commission and have published

rates between certain lines on basis of the principles laid down by the Georgia Commission.

These tariffs have destroyed the uniformity supposed to have been brought about by the order of the Interstate Commerce Commission and while to the advantage of some of the Georgia shippers are to the great disadvantage of other Georgia shippers, and it is the contention of the Georgia Public Service Commission that all shippers and railroads should be treated alike and be required to apply a single line schedule.

The petition just filed by the Georgia Public Service Commission presents a very peculiar and interesting question in regard to the authority of the Interstate Commerce Commission to deal with interstate rates under the act to regulate interstate commerce.

Gravel Rates Protested by Tennessee Firm

A COMPLAINT by T. L. Herbert and Sons, Nashville, Tenn., that the freight rates it pays on Tennessee River gravel for road building and maintenance are prejudicial to its interests was filed with the State Railroad and Public Utilities Commission there recently.

The building materials concern contends in its petition for a hearing on the matter that the material that it ships from Johnsonville is sent at a higher rate to Nashville than the chert and clay gravel used for the identical purpose, shipped from Camden by other companies.

Center County Lime Co. Wins Lengthy Rate Dispute

IN AN OPINION made public by the Pennsylvania Superior Court, a previous decision by the Pennsylvania Public Service Commission in regard to reparations sought by the Center County Lime Co. of Bellefonte from the Pennsylvania railroad was upheld. The case is one of several years' standing, and involves a dispute concerning freight shipments of lime and stone from the former Centre County plant, now a part of the Chemical Lime Co., from Bellefonte to stations not on the Bellefonte Central railroad. —Bellefonte (Penn.) Democrat.

Order New Sand and Gravel Rates in Illinois

THE Illinois Commerce Commission issued seven orders prescribing new rates for transportation of sand and gravel throughout a large portion of the state. The new rates apply to shipments of sand and gravel from Springfield and other cities to various Illinois points. These orders generally prescribe a readjustment on the joint rates for transportation of these commodities, and in some few instances represent an increased rate.—Springfield (Ill.) Journal.

Portable Crusher Operator Assumes Risk on Highways

RUMORS as to the whereabouts of a self-propelled gravel crushing outfit which seeks passage over county highways from Waukesha to Neopit, Wis., were received at the office of County Highway Commissioner McCullough July 13.

Mr. McCullough said he had not altered the stand he took when application was made for a permit to use the roads. He maintains that the movement of such a large outfit is not proper usage of the highway and refused a permit to the owner of the machine. In crossing Fond du Lac county the operator will travel at his own risk, being held accountable for any accident that might happen or any damage that might be done to the highway or bridges.

County Highway Commissioner McCullough refused the permit on the ground that the county was not protected by insurance and that in case of accident or damage he would be held responsible for having issued the permit.

The machine weighs double the tonnage which is allowed on highways in the state. The maximum load is 12 tons.—*Fond du Lac (Wis.) Commonwealth Reporter.*

Wage Question Delays Illinois Road Work

APPROXIMATELY \$25,000,000 worth of public works, mainly highways, scheduled for construction in Illinois in 1931 will be postponed from six to ten weeks under the Prevailing Wage Act passed by the recent session of legislature. Bids had been received before July 1 on \$10,000,000 worth of highway construction work, but the attorney general's office ruled that these contracts could not be awarded because the bids did not comply with the wage scale act which became effective July 1.

The new law provides that all political units of the state, in advertising for bids on public construction, must provide that the contractor shall pay wages equal to the prevailing rate in the community in which the work is to be undertaken. It is the duty of the political body to ascertain the prevailing wage and the law permits any 10 taxpayers to protest against the fixed scale before a special commission or before the court.

Lightning Hits Gravel Dredge

DURING the severe electrical storm which raged in Garfield Heights, Ohio, recently, loss of more than \$3000 was caused when lightning struck at two different places.

The greatest loss was incurred at the Broadway Sand and Gravel Co., Broadway, when a wooden dredge was ignited by one of the bolts. Garfield Heights firemen were called, but nearly \$3000 damage had been done before the blaze was gotten under control.—*Garfield Heights (Ohio) Record.*

Will Determine Authority of Commissioners in Not Awarding to Low Bidder

RECENT ACTION of the board of county commissioners in awarding contract for 5000 tons of maintenance gravel, to be delivered at Edmond, Okla., to the Southwestern Gravel Co. at \$1.95 a ton, was attacked July 13 when application for restraining order preventing carrying out of contract was sought.

The suit, asking a temporary restraining order enjoining the commissioners from allowing or approving any claims in connection with the contract, also sought to have the court set aside the recent award.

It was filed in the name of a taxpayer, who charged the contract was not awarded to the lowest bidder. Other bidders, lower than the one getting it, include L. L. Massey and the Concho Sand and Gravel Co.

Commissioners said a similar suit, in the form of an appeal to the county court, was on file on behalf of Mr. Massey. The question, the commissioners said, is whether the board is compelled to award contracts to the lowest bidder or to use its judgment on various types of gravel submitted. No hearing date was set for the application.—*Oklahoma City (Okla.) Times.*

Road Builders Cooperate in Research with Other Associations

IN ADDITION to studies of equipment problems in cooperation with the American Association of State Highway Officials, some of the other projects in which the American Road Builders' Association is co-operating have been begun by which recent practical developments in design and construction will be studied in cooperation with other organizations as follows: Asphalt pavements, with the Asphalt Institute; central and truck mixed concrete, with the National Ready Mixed Concrete Association, American Concrete Institute and American Society for Testing Materials; concrete pavements, with the Portland Cement Association; low cost roads, with the Asphalt Institute and the tar industry.

The reports deal with the utilization of highway facts and will contain recommendations, conclusions and trends, a summary of application of findings, details of findings and a bibliography.

The finally approved report will be presented by the committee chairman at the 29th Annual Convention and Road Show in Detroit, Mich., January 11-15, 1932.

The purpose of this cooperative work is to take up the lag between the discovery of new facts through research and application of such facts in road building.

Charge Kansas Contractors with Control of Bid Price

CHARGING VIOLATIONS of the Kansas anti-trust laws, Attorney General Boynton announced recently the filing of ouster proceedings against the Kansas Contractors Association. The district court has granted a temporary restraining order prohibiting A. L. Cook, treasurer of the association, from disposing of any of the organization's funds pending a hearing set for an application for a permanent injunction against the association and its members.

According to Mr. Boynton's petition filed in the district court, members of the association are alleged to be furnished with information and various other services prior to the letting of state highway contracts in such form as to amount to an agreement as to what figures shall be bid on the highway projects.

The petition charges that the member contractors are charged one-fourth of 1% of the amount of their highway contracts, that percentage being added to their bids.

American Materials for Public Work in Texas

IN ORDER to encourage and increase the activity of American producers, resolutions have been passed by the Texas legislature requiring the use of American materials in all public work in the state. Certain foreign commodities are not available in the United States and there are others of low price which act as a spur to American producers toward higher efficiency in order to meet this foreign competition. An element of competition is beneficial where costs and selling prices are on a fair basis, considered from the standpoint of legitimate profit to the producer under the wage scales and standard of living prevailing in this country.

However, when materials for public buildings, highways and other public work are needed, preference should be given to American-made goods rather than to imported products. Public work is paid for by the public; American labor and business, through taxes, supply the money for this public work. It is only fair that American industries should have the opportunity to supply the materials, the making of which creates employment and increases domestic activity and trade.—*Manufacturer's Record.*

Mica in 1929

A PUBLICATION on mica in 1929 prepared by B. H. Stoddard has recently been issued by the U. S. Bureau of Mines. This paper gives an economic study of production and prices. A review is then given of operations by states. Uses of the several types of mica are discussed and detailed information of the different varieties of mica is given. Data on imports and exports and on world production are included.

New Canadian Diatomite Plant Gets Contract

DIATOMITE PRODUCTS, LTD., which has constructed a plant for the production of diatomite at Martin's Siding near Huntsville, Ont., has obtained a contract with a firm of chemical importers for the sale of its entire output. The price to be received represents a decrease of 10% below current quotations on delivered carload lots. The life of the sales contract is for two years, renewable for similar periods on terms mutually to be agreed upon. Shipments are expected to be made as soon as the mill is completed.

The company has constructed a settling basin with an 8-in. pipe line laid down to a dredge at Slocombe Lake. The dredge and power plant are now in operation. The dredge has a pumping capacity of approximately 1100 gal. of diatomaceous mud per minute, and the company estimates that with each filling of the reservoir an equivalent of at least 6000 tons will be available for refining which represents a year's mill capacity. The power plant, filtrator, buildings, furnace and storage buildings have been completed. The power house is equipped with a 200-hp. Diesel engine, and drives a 165-hp. generator. This plant supplies power to the suction dredge on the lake as well as power for the furnace, elevators, grinder and bagging plant.

The foundations for the furnace have been completed and the furnace parts are being prepared for shipment from the foundry to the company.—*Toronto (Canada) Financial Post.*

Open New Brunswick Gravel Plant

OPERATIONS at Fort Dufferin, West Saint John, New Brunswick, Canada, of the Fundy Sand and Gravel Co., Ltd., financed by local capital and employing local labor, were commenced July 7.

G. Stephen Whitehead, contractor, who is manager of the new company, of which G. G. Murdoch is president, Luther Smith, vice-president, and L. McC. Ritchie, secretary, said that eight men were at present employed, and that the capacity of the plant is 300 yd. a day.

The plant, fully equipped electrically, is the largest in the province, Mr. Whitehead said, and will turn out aggregate to any specifications from 3-in. to No. 12 sand.

An 85-ft. mast, from which the beach bucket runs on a cable, and an elevated bin capacity of 800 cu. yd. are features.

It is the intention of the company to have two railway sidings under the bins at a later date, besides room for trucks, once the full working capacity is reached.

"In every possible instance, Canadian-made goods were used," the manager said. The plant cost \$25,000.—*St. John (N. B.) Times-Globe.*

Studies Relation of Hardness and Strength of Cement

AN INVESTIGATION of the relation between hardness and strength of portland cement by Shichiro Uchida is reported in the May issue of the "Memoirs of the Sendai Higher Technical School," Sendai, Japan.

According to Dr. Uchida, the degree of hardness of hardened cement, or its variation during setting or hardening, has not yet been measured. If the hardness of cement increases with the increase of hardening of the concrete, we can tell the quality of cement by measuring its hardness. Therefore, he investigated the hardness of portland cement during hardening, and also a hardened specimen. According to the writer's results, the relation between hardness or strength and age is given by the formula

$$z = A \{ 1 - (1 + y)^{-n} \}$$

in which z is hardness number or strength, y is age in days, and A and n are two constants. Also, the writer has concluded that the relation between strength and hardness takes place according to the equation

$$a = u \cdot H^m$$

in which a is the strength in kg. per sq. cm. at any given time, H is the hardness number, and u and m are two constants, depending on the material. These conclusions are the result of a very comprehensive study.

Buys Colorado Quarry

PURCHASE of the lime quarry at Monarch by the Minnequa plant of the Colorado Fuel and Iron Co. from Warren E. Burton, operator for the past seven years, was announced recently.

Mr. Burton has been selling almost the entire output of the quarry to the local plant since his taking over of the enterprise.

During the year of 1930, 5300 cars of limestone were shipped to Pueblo by the quarry for the Minnequa plant. This year, up to April 11, 65,000 tons of rock were shipped into Pueblo. With acquisition of the quarry, the C. F. and I. will enlarge operations, it is understood. Employment at the location is expected to be sizably increased. Robert Jarrard, operator of the quarry at Calcite for the past 25 years, will direct operations at Monarch.—*Pueblo (Colo.) Chieftain.*

Open Quarry in Missouri

ROCK from the P. P. Young quarry, just north of the St. Joseph, Mo., city limits has been tested and found of good quality for street work there, it has been announced by Hale D. Judson, city engineer. He said the rock will be used in work now under way by Mr. Young.

Rock from the quarry was used many years ago for curbing before concrete was substituted for stone.—*St. Joseph (Mo.) News-Press.*

To Build Plant in Missouri for New Type Brick

CONSTRUCTION of a new factory which will produce a type of building and paving brick at present manufactured only in Germany, brick composed of ground chat from lead mines, silica sand and lime hardened in cylinders under 150 lb. of steam pressure, is to be started soon near Festus, Mo.

The plant is to be erected by a Missouri firm sponsored by the German company that produces the brick at present, the Komnick Process Brick Co. The parent firm is the F. Komnick Maschinenfabrik Co. of Elbing, Germany. The factory will cost about \$105,000, will produce 50,000 brick a day and will employ 50 men.

Brick made by the Komnick process contain no clay and require no burning in kilns. Samples of the brick have shown it will have a crushing strength of 5500 lb. and a moisture absorption of 7% in 24 hr. The cost of its manufacture is far less than that of clay brick, according to Albert Seelig, vice-president of the new firm, which has offices in Festus, Mo.—*Chicago (Ill.) Journal of Commerce.*

Claims Slag Is Suitable for Glass Manufacture

AN ANNOUNCEMENT by C. A. Basore, industrial research chemist at Alabama Polytechnic institute, that waste slag could be used profitably in the manufacture of glass was recently made.

Dr. Basore conducted his experiments with Birmingham, Ala., sand, which is very scarce, and would make glass manufacture in the south, using slag from southern mills, very expensive. A survey by the Pueblo, Colo., Chamber of Commerce several years ago revealed that the sand which abounds near Pueblo is high-grade glass sand.

The material the chemist evolved from sand and slag was a high-grade glass of unusual elasticity, clarity and of high tensile quality. Some of the glass, apparently, possessed excellent insulating qualities.—*Columbus (Ohio) Citizen.*

To Develop Colorado Phosphate Bed

DEVELOPMENT of phosphate land near Canon City, Colo., is contemplated by George T. Hein of Denver, who has filed application with the land office for phosphate rights on 640 acres.

There is a bed of apatite 6 to 10 ft. thick which runs about 60% tricalcium phosphate, according to Mr. Hein's filing. He will treat the phosphate and market it for fertilizer.

A few days ago a similar application was filed on land in the same region. The two requests are the only ones of their kind ever filed here, according to the registrar of the land office.—*Denver (Colo.) Post.*



First-aid contest at time of dedication of trophy at plant of North American Cement Corp., Howes Cave, N. Y.

Trophy Dedications Continue

Several More Safety Ceremonies Held at Winning Cement Mills

"UNPRECEDENTED," "unparalleled," and "remarkable" are strong adjectives which have been used freely by visitors to describe the series of meetings being held in the 43 cement mills which won the Portland Cement Association's safety trophy for 1930.

Up to date, 24 of these occasions have been held; hundreds of civic and industrial leaders have visited the mills and become acquainted with accident prevention methods in use in the industry; and thousands of workmen's families, neighbors and interested local citizens have joined with the men in a day of rejoicing for a year without an accident.

Before the series of celebrations is complete, few leading cement executives will not have participated, and more than a third of the operating men of the mills within association membership will have received the personal congratulations of their leaders.

The task of dedicating and rededicating the huge cast stone trophies started in May and will probably extend over six months.

Nazareth Dedicates on June 12

The Nazareth Cement Co. held very interesting ceremonies on June 12, on the plant grounds, where the trophy had been erected, facing the main highway.

The newly organized Nazareth High School band provided music. George F. Coffin, secretary and treasurer of the company, gave the address of welcome. J. B. John, president of the Medusa Portland Cement Co., chairman of the committee on accident prevention, presented the trophy. It is the same type of trophy as has been awarded to other mills in similar campaigns, and is the recognized standard of the safety movement in the cement world.

H. A. Reichenbach, general superintendent

of the plant, accepted the trophy. Mrs. Hannah Durham, daughter of Col. E. M. Young, president of the Lehigh Portland Cement Co., spoke briefly but interestingly, after which first-aid training certificates were given out by Jesse Henson of the Department of Commerce, Bureau of Mines. The first-aid team of the plant gave an exhibition of first-aid work.

Fogelsville, Penn., June 16

Fogelsville mill of the Lehigh Portland Cement Co. held its trophy rededication at 10:30 a.m. on Tuesday, June 16, this hour being decided upon so as to facilitate similar ceremonies at the Ormrod mill of the Lehigh company on the same afternoon.

Ray A. Moritz, superintendent, and Lt.-Col. H. A. Reninger, chairman, called the meeting to order. J. B. John, chairman of the committee on accident prevention, Portland Cement Association, presented the Association trophy, which Ray A. Moritz accepted. Interesting addresses followed by Col. E. M. Young, president, Lehigh Portland Cement Co., and Julien Harvey, National Safety Council, New York.

Mill No. 2, Ormrod, June 16

The program at Ormrod plant No. 2 of the Lehigh Portland Cement Co., on the afternoon of June 16, was as follows:

W. J. Montz, superintendent, and Lt.-Col. H. A. Reninger, chairman, called the meeting to order. The trophy was presented by



Safety Committee, Lehigh Portland Cement Co., Plant No. 2, Ormrod, Penn.

J. B. John, chairman of the committee on accident prevention, Portland Cement Association, and accepted by W. J. Montz. Col. E. M. Young, president, Lehigh Portland Cement Co., and Julien Harvey, National Safety Council, New York, each delivered an address.

Sandt's Eddy, Penn., June 17

Sandt's Eddy mill of the Lehigh held its ceremonies on the day following those at Fogelsville and Ormrod.

The welcoming address was given by J. A. Gish, Jr., superintendent. J. B. John, chairman of the committee on accident prevention, Portland Cement Association, presented the Association trophy. J. A. Gish, Jr., accepted it. Col. E. M. Young followed this with an address.

Portland Point, N. Y., June 17

Dedication of the Association safety trophy awarded to the Portland Point, N. Y., plant of the Pennsylvania-Dixie Cement Corp., occurred at the plant near Ithaca on Wednesday afternoon, June 17. The ceremony was in several respects one of the most outstanding of the year. Headed by the Ithaca band, 150 plant employees and their families, 500 in all, marched within the plant grounds to the site of the trophy.

Seated before the speakers' platform on one side were the school children of Portland Point; in the center were the plant workers, with banners identifying their various departments; on the other side were the wives, smaller children, friends and neighbors. Seated on the platform were officials of the Portland Cement Association and the Pennsylvania-Dixie Cement Corp. and their guests.

R. B. Fortuin, assistant to the general manager of the corporation, called the assemblage to order and presided throughout the ceremonies.

In behalf of the city of Ithaca, Mayor Bergholtz extended a welcome to the guests



Lehigh officials at Iola, Kan., rededication. Left to right: Daniel E. Ritter, operating vice-president; Col. E. M. Young, president, and Lieut.-Col. H. A. Reininger, in charge of safety activities

and commended the employees of the Portland Point plant of the Pennsylvania-Dixie Cement Corp. on its safety achievement. G. S. Brown, past president of the Portland Cement Association, made the presentation of the trophy, which was accepted by E. H. Schwartz, past chairman of the safety committee of the local plant.

In accepting the trophy, Mr. Schwartz spoke in behalf of the employees, through whose effort the year 1930 went down as perfect in no lost-time accidents. He pointed out the effort which had been made by the employees since 1925 to win the trophy, only to lose out by one or more accidents. This was extremely discouraging, he said, but not to the employees of Plant No. 7. They began each year with a new determination, and by individual watchfulness and carefulness of

each other the year 1930 passed unmarred.

Other speakers, all of whom commended the employees, were Blaine S. Smith, president of the Pennsylvania-Dixie Cement Corp.; County Judge Willard M. Kent; Morris Fortuin, general manager of the local plant; Felix Guenther, superintendent of Plant No. 1 of the Pennsylvania-Dixie Cement Corp. at Kingsport, Tenn., the first plant to receive the trophy; and John A. Miller, chairman of the board of directors.

Floyd Werner, superintendent of the local plant and chairman of the safety committee for 1930, was presented a wreath by the employees in appreciation of his sincere effort in keeping the accident slate clean.

Following the ceremony the employees and their families went to the lake shore, where they got together for an old-fashioned picnic dinner.

Universal, Penn., June 20

Universal, Penn., the little town at which is located the Universal Atlas Cement Co.'s Pittsburgh mill, turned out en masse on Saturday afternoon, June 20, for the dedication of the Association safety trophy won by that mill. The Universal plant record is a unique one in that more cement was manufactured without lost-time accident than at any other plant. In winning the trophy, Universal plant worked more man-hours than at any winning plant in the United States and, with one exception, in the entire Association membership.

Superintendent R. L. Slocum presided at the ceremonies, which were held at the junction of the main road with the plant property, on a grass oval constructed as a setting for the monument. The drum and bugle corps of the local Boy Scout Council furnished the opening feature of the program



Unveiling at plant of Pennsylvania-Dixie Cement Corp., Portland Point, N. Y.



Procession of workmen marching to ceremony at Foglesville, Penn., plant of Lehigh Portland Cement Co.

and also provided a concluding number in the form of a short drill.

Francis Feehan, mine safety commissioner of the U. S. Bureau of Mines, presented the plant organization with the Joseph A. Holmes award for outstanding safety accomplishment. A. J. R. Curtis presented the Portland Cement Association trophy. The Holmes award was accepted by J. R. Cline, assistant superintendent, and the Association trophy by Superintendent Slocum.

Addresses were made by W. J. McGregor, coroner of Allegheny county; E. D. Barry, assistant operating manager, Universal Atlas Cement Co., and G. E. Clarkson, director of the Western Pennsylvania Safety Council.

Among the distinguished visitors were Gordon Huth, safety director, Universal Atlas plants, and W. P. Rice, superintendent, Crescent Portland Cement Co.

New Castle, Penn., June 24

The rededication of the Association trophy at the New Castle, Penn., mill of the Lehigh Portland Cement Co. took place on June 24. The company management was represented by Joseph S. Young, vice-president and assistant to the president, and D. E. Ritter, vice-president in charge of operation. Col. H. A. Reninger represented the company safety department and A. J. R. Curtis was present for the Portland Cement Association.

During 1927 the New Castle plant succeeded in completing the year without accident, winning a trophy from the Cement Association at that time. A few accidents marred the record of the two succeeding years, but in 1930 mishaps were entirely avoided.

W. H. Kleckner, superintendent, and Col. Henry A. Reninger, chairman, called the meeting to order. A. J. R. Curtis, Portland Cement Association, presented the trophy and W. H. Kleckner accepted it. The Hon. George T. Weingartner gave an address, as also did Joseph S. Young, assistant to the president.

Reports of other dedication ceremonies will follow next month.

Quarry Accidents in 1929

ON ONLY THREE occasions in the history of stone quarrying and related industries in the United States has the mortality rate from accidents connected with the employees' work been as low as that in 1929, says Bulletin 338 of the U. S. Bureau of Mines, entitled *Quarry Accidents in the United States in 1929*. Detailed statistics are then given on accidents of the year. Comparative information is also given. An analysis of accidents is shown so that a study of every phase of operations can be made.

Cement Plant Accidents in 1930

A STRIKING comparison, and one of which the portland cement industry may well be proud, is made in the *Accident Prevention Magazine* for the second quarter of 1931, recently issued by the Portland Cement Association.

In the cement plant the accident rate per 40,000 persons working 10 hr. is 2.52; in the home, 4.8; for automobile drivers or passengers, 5.13; for pedestrians, 6.84; and for all industry, 7.39.

Detailed statistics on accidents in the industry in 1930 are also tabulated in the second quarter issue.

Holmes Safety Association

THE PLAN OF ORGANIZATION and activities of the Holmes Safety Association and the procedures for establishing district councils and local chapters of the association are given in Information Circular 6481 published by the Bureau of Mines under date of July, 1931.

This association, which was organized some years ago, has as its aims the promotion of safety and health measures and its help is available to quarrying and allied industries.

In cooperation with the Bureau of Mines a monthly publication, the *Holmes Safety Chapter Notes*, is issued.

Explosives Makers Adopt Release Forms for Field Service Men

AT A MEETING of the Institute of Makers of Explosives held at Atlantic City July 9 and 10, member companies agreed on release forms which customers will be asked to sign when blasts are supervised by the field men of explosives manufacturing companies.

The Institute has devised two forms of release from liability for any damage which may be done by blasts supervised by explosives manufacturers' field men, where conditions may occur which can neither be foreseen nor guarded against.

Therefore these forms have been adopted to avoid any questions or controversies which might arise in these matters and the users of explosives accepting free services of explosives companies' employees will be called upon to sign one or the other of these release forms.

Explosives Industry History

A PUBLICATION recently announced by the Institute of Makers of Explosives is the "History of the Explosives Industry in America," under whose auspices the volume was published.

The authors of the volume are Arthur Pine Van Gelder and Hugo Schlatter. The publisher is the Columbia University Press, New York, N. Y.

The writers present a comprehensive outline of the industry and, at the same time, give glimpses of the Nation's economic growth as expressed in terms of mining, railroad and waterway construction, sanitary systems, hydro-electric and other projects.

The writers present a picture of the value of gun powder in the progress of civilization and the making of history. An equally valuable contribution concerns the development of high explosives, with which so great a part of the work of the world is done.

Self-Unloading Sand Boats Building Chicago Parks

UNDER THE AUSPICES of the Western Society of Engineers and through the courtesy of the Construction Materials Co., Chicago, an interesting trip was made July 24 by a party of engineers to view the filling work now under way at the north end of Lincoln Park.

Here 260 acres of new land are being made by filling in with sand dredged from the lower end of Lake Michigan. The contract for this work, which is held by the Construction Materials Co. and part of which has been sub-contracted, calls for 7,000,000 cu. yd. of sand fill.

About 15% of this is now in place and it is expected to carry on at the rate of about 800,000 cu. yd. per month. Seven boats are now in use bringing their loads in to three different piers adjacent to the work and pumping the sand into place through 28-in. and 18-in. pipe lines.

The largest of the boats being used is the *J. R. Sensibar*, owned by the Construction Materials Co. This vessel, which is arranged for unloading its cargo either by belt conveyor or by pumping, was briefly described in *Rock Products*, November 22, 1930. In this instance its two 30-in. centrifugal pumps are being used to dredge the material from the lake bottom and then to pump it into place. More than two trips are being made daily and the 6000 cu. yd. cargo discharged in less than 4 hrs.

Canadian Quartz Production in 1930

QUARTZ PRODUCTION in Canada during 1930 amounted to 226,200 tons valued at \$418,127 as compared with 265,949 tons at \$561,527 in 1929, according to finally revised statistics just issued by the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics at Ottawa. The Canadian production consisted of 8057 tons shipped from Nova Scotia quarries, 49,561 tons from Quebec, 167,487 tons from Ontario, and 1095 tons from British Columbia. Quartz for use as a flux was produced in Ontario and British Columbia while in Manitoba a silicious gravel was employed for metallurgical purposes. Considerable tonnages of crushed silica rock and silica sand were shipped to glass manufacturing plants and electrometallurgical works. Interest has recently been shown in the development of silicon esters for use in protecting stone surfaces from weathering and more recently as a paint vehicle—(*Canadian Chemistry and Metallurgy*.)

Imports into Canada of siliceous or crystallized quartz totaled 5040 tons valued at \$111,473 in 1930; in 1929 the imports were recorded at 3995 tons valued at \$79,653. Flint importations in 1930 reached a total of 3878 tons valued at \$37,811 as against 3595 tons appraised at \$39,272 in 1929.

Texas Commission Orders Rate Division with Short Line

AN IMPORTANT RULING affecting railroads and many industries in Texas has just been made by the railroad commission. In the particular case that came before it the commission held that owners of a gravel pit may charter and operate as a common carrier a railroad, however short the line may be, and that such road is entitled to a division of the freight returns with its intersecting line.

The hearing of the commission was on the division of freight revenue to be given the Sanford and Northern, a new line running 1.4 miles from Sanford, on the Chicago, Rock Island and Pacific railroad in Hutchinson county, to a gravel pit at Riverside. The Rock Island had refused to give the Sanford and Northern a division, stating it was owned by the gravel company and built to haul that company's products. The railroad commission held under a ruling from the attorney general that a division was necessary because the road was chartered as a common carrier.

The amount of the division was not fixed and attorneys were given until August 1 to file their briefs. The joint line rate is higher than the single line rate, but the gravel company's share will more than offset that, attaches of the commission said. O. D. Hudson, rate expert of the railroad commission, predicted that companies operating some 25 to 30 other gravel pits in Texas would adopt a similar policy. Heretofore they have borne the expense of hauling to the trunk line.

Outlook Good for Limestone Trade on River

INDICATIONS are that the towing of limestone on the Allegheny river from Templeton to Pittsburgh, Penn., will be increased in the near future. Plans are under way to install a second boat in that trade as considerable time is lost at the Herrs Island, Aspinwall and Springdale locks.

It is generally believed that in time the amount of this raw material carried on the Allegheny river will nearly equal the coal tonnage shipped on the Monongahela river. To make the entire deposit available for river transportation, it was said another lock and dam will be necessary to extend slack-water further upstream. The Jones and Laughlin Steel Corp. and the Carnegie Steel Co. own large tracts along the existing pools.

Congressman Nathan L. Strong, president of the Allegheny River Improvement Association stated that there are three seams of limestone, one of them 15 ft. thick, on the Allegheny river, easily accessible for water transportation. With the removal of a low bridge spanning the river at Kittanning, modern towboats will be entered in the limestone trade, which then will assume large proportions, river men say.—*Pittsburgh (Penn.) Post Gazette*.

Getting Publicity on Agricultural Lime and Limestone

MANY OHIO PAPERS have carried the following story on the lime requirements of soil in the production of crops. Producers of agricultural lime and limestone throughout the country should benefit by giving this statement wider publicity. The report that follows was taken from the *Jamestown (Ohio) Journal*.

Farm products remove considerable quantities of lime from the soil, declares J. A. Slipper, soils specialist at the Ohio State university, who believes that crop yields on many Ohio farms may be increased by applications of lime.

A ton of alfalfa, he points out, removes from the soil the equivalent of from 70 to 140 lb. of limestone. One cow puts into her milk as much lime as is contained in 300 bushels of corn, and an average steer walks off the farm with 30 to 40 lb. of lime in his bones and body tissue.

To make profitable yields, clover and alfalfa need a soil well laden with lime. Experiments show, he states, that an acre's growth of alfalfa draws from the soil the equivalent of about 170 lb. of limestone each year. A single acre of alfalfa draws from the soil the equivalent of about 255 lb. of limestone each year. Soils lacking in lime fail to produce profitable yields of legumes.

Report Dredge Breaks Sewer

IT WAS DISCLOSED in Moundsville, W. Va., council meeting recently that a dredge of the Standard Sand and Gravel Co., with headquarters at Wheeling, recently broke the Moundsville city sewer which extends out into the Ohio river. Mayor Ruble and Engineer Sammons told the council that the sewage carried through that line, instead of being carried about 200 ft. out across the river bed to the channel current, is now being discharged into slack water at the broken end of the sewer about 30 ft. off-shore.

J. W. Rickey, city solicitor, was directed to write the company and ask for an immediate answer as to when the repair will be taken care of or an adjustment made. Mayor Ruble said it would cost the city at least \$500 to build a cofferdam and repair the broken 16-in. cast iron sewer.

The breaking of the sewer was done, the mayor and city engineer told council, by a Standard company dredge boat while dredging for a deep water approach to the new river dock and tippie of the Ben Franklin Coal Co. In order to secure a loading tippie at Moundsville, these officials said they are informed, the Standard Sand and Gravel Co. secured permission to use the lower end of the Ben Franklin company's new dock. In return for that privilege, the Standard dredge boat is doing the dredging to provide the deep water approach for barges to the dock.—*Moundsville (W. Va.) Echo*.

Announce Plans of Federal Gravel Co.

EZRA SENSIBAR, official of the Federal Gravel Co., recently announced the company's plans for development of its production unit at Greenbush, Alcona county, Mich., following the decree of Circuit Judge Houghton of Bay county enjoining the Detroit & Mackinac Railway Co. granting any concessions to the Alpena Gravel Co., from discriminating against the Federal or Michigan Gravel Co. in favor of the Alpena Gravel Co. and from engaging, directly or indirectly, in the production and sale of gravel for commercial purposes.

The Federal company aims to have the Greenbush plant in production by mid-August, said Mr. Sensibar. The plant will have a capacity of 70 cars a day and five steel bins, 50 ft. high by 21 ft. in diameter, and will have storage for 3000 tons in various sizes.

The plant will be steel and reinforced concrete construction, said Mr. Sensibar. A crawler type crane with a $1\frac{1}{2}$ yd. bucket will excavate the gravel which will be dumped in a portable steel hopper, dropped thence to trucks which will carry it to the crusher plant; from the crusher, a belt conveyor will take it to the storage bins; another belt will convey it from the bins to cars, mixing it in any sizes.

Under Judge Houghton's decree which awarded the Federal Gravel Co. a verdict of \$155,000 and costs against the Alpena Gravel Co., the latter has 20 days in which to file a \$200,000 bond which will be required if the Alpena company wishes to appeal the case to the Michigan supreme court.—*Alpena (Mich.) News*.

Open New Sand and Gravel Plant in Texas

GROUND WAS BROKEN at Comfort, Tex., July 9, for a new industrial development.

The Standard Concrete Products Co., with Ernst Lindner, B. W. Glaser and Ernest Hildebrand as directors, is installing a gravel and sand washing and screening plant on the gravel pits and sand bank along the banks of the Guadalupe river on the Rud. Heinen place. A test of this gravel and sand made by the state highway commission laboratory at Austin has shown this to be among the finest material to be found in the entire state. Since the test was made and specimens left with the Commission, orders for the material have come in from various parts of the state.

In a short time the company will be ready to turn out material in quantities, and will be prepared to ship out its products. Heretofore sand for construction of any kind was shipped in and the local gravel was not acceptable for highway construction.—*Comfort (Tex.) News*.

Large Sand and Gravel Plant Nears Completion in New York

ALARGE SAND AND GRAVEL plant will be located soon in Otsego county, New York. A big cement and iron structure is being completed at South Edmeston near the Unadilla Valley railroad to house the business and it is expected that it will be in full operation about August 1.

The railroad company is behind the project, having purchased the 90-acre farm of Howard Whitten following a careful survey. With about 3,000,000 yd. in sight, the gravel and sand can be taken out at the rate of 25,000 tons annually and the plant be assured of at least 50 years of operation.

A very encouraging feature of the project is that the gravel and sand have been thoroughly tested and approved by the state engineers for highway and other construction work, where the most exacting material is needed. This may create a far-reaching demand for Unadilla Valley gravel and the necessity of shipping long distances. Both fine and coarse sand will be available, besides all sizes of gravel and crushed stone.

This huge plant, which will crush the stone, sort and deposit it in bins, was designed by the Goods Roads Machinery Co., of New York City. The contract for the steel work was let to the Belmont Iron Works of Philadelphia, Penn., and the erection of the steel to Ferry and Macey of Beacon. The electrical equipment is being furnished by the Westinghouse company of Pittsburgh, Penn.

The main building is 70 ft. high, of which 36 ft. is concrete and the upper part steel. It is 26 ft. wide by 140 ft. long. There are 14 bins in the lower part of the main building, 20 ft. deep, each holding 250 tons of material. Seven of the bins deliver by steel chutes into freight cars and seven into trucks. The steel contract alone amounted to \$40,000.—*Oneonta (N. Y.) Star*.

Florida Pays Higher Price for Sand

ASKED about the alleged purchase of sand at higher prices from a firm in which a brother of a member of the state road department is a partner, Chairman Bentley testified that the price of sand had gone up, but "he did not know whether the firm held a monopoly on sand."

Representative Dann testified that the price of sand had increased this year from $27\frac{1}{2}$ and 30 c. a ton to 65 and 70 c.

It would seem that the chairman of the road department should know whether one firm had a monopoly on sales to that department, whether of sand or any other material. It should also be ascertained if the firm mentioned or any other firm is getting the benefit of an increase of more than 100% in the price of sand sold to the state.—*Tampa (Fla.) Tribune*.

New York Sand Producing Company Organized

ANNOUNCEMENT of the incorporation of the Altmar Sand and Gravel Corp. of Syracuse and Fulton, N. Y., to develop a 100-acre sand bed at Altmar, was made July 20 by John J. Hopkins who, with Walter Bradley and John T. Sullivan, both of Fulton, formed the corporation.

The deposit is one of the only two in central New York, according to Mr. Hopkins, which produces concrete sand approved by the bureau of standards of the state department of public works. There are no approved sand beds in Onondaga, Cayuga or Cortland counties and only one other—at Lacona—in Oswego county.

Equipment is being installed and the company will be ready to begin business August 1. Water will be taken from the Salmon river, which adjoins the property, with private sidings from the New York Central for movement of cars.—*Syracuse (N. Y.) Journal*.

Convert Gravel Pits to Park

A MOVE TO PURCHASE for the city of Indianapolis, Ind., the new park now being built on the site of the gravel pits at Harding and Raymond streets has been initiated by a group of public spirited Indianapolis citizens.

The group of business men who have undertaken this park personally are not unwilling that the city should have it, if the people want it, although they are making no effort to sell the location.

Being public-spirited themselves, and having gone into this as a public enterprise, they want it to benefit the largest number of persons possible.

If city ownership will do this better than private ownership, they will not stand in the way, they say.

In the meantime there are thousands of Indianapolis citizens who wish the beaches, that will be open to the public in any event, were ready now.—*Indianapolis (Ind.) Times*.

Texas Sand and Gravel Producer Increases Capacity

IT IS UNDERSTOOD that the East Gravel Co. is installing additional machinery at its pit a few miles west of Crandall, Tex. At present there is almost a train load of gravel going out each day.

There were 235 carloads of gravel shipped from Crandall, the shipping point for the company, during the week ending July 8.

The gravel at this pit is among the choice of the state, and an almost unlimited supply is available according to reports. It was estimated when the pit first opened that there was enough to last something like 35 years, and only a minor part of this has been removed so far. The company ships gravel, sand and rock.—*Crandall (Tex.) Star*.

Four More Lime Kilns for Whiterock Quarries

OPTIMISM and belief that the present business depression is only a slow-down preceding a new era of prosperity is suggested in an announcement by officials of the Whiterock Quarries, which recently broke ground for four additional lime kilns to supplement its present equipment.

The announcement, which embodies a brief report of that company's activities in the past year, declares that the Whiterock plant has been working to full capacity since December 15, 1930, that no wage cuts have been made and none are contemplated. The wage scale, on the contrary, has been steadily rising.

The decision to construct four additional lime kilns was made at this time, officials of the plant said, because the present low price of material, combined with the fact that even a slight increase in business would embarrass the present facilities of the plant, made such additions both economically advisable and necessary.

Will Experiment with Electric Kilns

The four new kilns will be of the most modern type of shaft kiln, and will increase the output of the plant by approximately 80 tons daily. Preparations are also being made at this time to conduct a series of experiments on electrically heated lime kilns. These experiments will be carried on in conjunction with one of the foremost builders of electric furnaces in the United States. This type of kiln promises to be the last word in lime burning processes and may revolutionize the lime industry, inasmuch as tremendous capacities are possible with a much lower investment.

If these experiments are successful, it will be practical for Whiterock Quarries to convert all of the present shaft kilns, with no interruption of production.

The four kilns now under construction ordinarily would cost about \$10,000 each.

Earnings Declared Satisfactory

Ray Noll, secretary, treasurer and general manager of the company, declares that the earnings of the company this year have been very satisfactory, with every prospect for further improvements in business as the year progresses.

Regular daily shipments of road stone, open hearth fluxing stone, blast furnace limestone, pulverized limestone and all forms of lime are being made and shipped to markets. It is significant that, despite the general business depression, no wage cuts have been made to Whiterock employees, and that the wage scale at present is higher than during the war or post-war periods.

Officers of the Whiterock Quarries are: W. Fred Reynolds, president; A. Fauble, vice-president, and Ray C. Noll, secretary, treasurer and general manager.—*Bellefonte (Penn.) Democrat*.

Mine and Quarry Veteran Dies at 100 Years

SILAS P. TOMKINS, who was 100 years old January 30, died at his home in Matawan, N. J., July 20.

Mr. Tomkins was a self-educated civil engineer. At various times he engaged in the manufacture of soap and was a coal dealer and prior to coming to Matawan in 1906 had charge of the limestone quarry of the Delaware and Lackawanna Steel Co. at Franklin Furnace.

Ten years were spent by Mr. Tomkins in uncovering the Tilly Foster Mine for the Lackawanna railroad. While in the west he laid out a city. He invented and patented many devices.—*New York (N. Y.) Times*.

Must Use Colorado Made Cement

IN THE CONTROVERSY which arose and the stopping of paving work in the city of Denver, Colo., because some contractors purchased cement from the Monolith Portland Cement Co., the cement made at Laramie, Wyo., City Attorney Parriott, to whom the case was referred, has ruled:

"The Colorado law, giving preference to the use of Colorado materials in public works of statewide concern, applies to street and alley paving in Denver. There is also authority in the charter to give the manager of parks and improvements the right to buy its own materials for paving and ask for bids on the basis of labor and such materials as the city may not furnish."

New Texas Plant to Use Limestone and Silica Sand

THE Southern Alkali Corp. \$10,000,000 plant to be erected at Corpus Christi, Tex., when running at full capacity will consume approximately 2500 tons of limestone daily, according to a statement made by J. C. Kennedy, president of the Central and Southwest Utilities Co. Later, it is expected that millions of tons of Texas silica sand will be included in the raw materials consumed. Those who are on the watch tower predict more industrial development in Texas in the next ten years than in the past fifty.—*Brownwood (Tex.) Bulletin*.

Canadian Sand-Lime Brick

PRODUCTION of the sand-lime brick industry in Canada was valued at \$671,301 in 1930, a Dominion Bureau of Statistics report shows.

This was 30% below the corresponding figure for 1929 and was the lowest output value for the industry since 1926. Products included sand-lime brick and ready-mixed mortar and plaster. For sand-lime brick alone the output in 1930 was 52,770 M valued at \$567,022 as compared with 78,361 M at \$953,726 in 1929.

City Attempts to Force Use of Home State Cement

A RECENT DISCUSSION regarding the kind of cement used in several street jobs in Portland, Ore., and the question arising therefrom as to whether the city must accept the jobs from the contractor, for which a differential of 5% on cement manufactured outside the state was intended, has been passed upon by City Attorney Grant in a way favorable to the contractor.

In these jobs it was the understanding that Oregon cement was to be used, but it later developed that some California material went into the mix and this aroused complaint.

The city council must accept the improvement, in the opinion of the city attorney, however, regardless of this use of California cement, as it was the duty of the city inspectors to see that proper materials were used as specified. The completed paving has been inspected and has been found good pavement under test, it is said.

"If the contractor had used throughout the job all California cement then there could be no question that he did not comply substantially with his contract," said the attorney, "but having complied to a large degree with his bid, and the engineer having tested the pavement and found it to be properly constructed, according to plans and specifications, we do not think that the city is now in a position to say that substantial compliance has not been evidenced by the contractor."

City Attorney Grant has reserved for future ruling the question as to whether "transit mix concrete" in which California cement is used is an Oregon product.

Russian Potash Plans Production Schedule

WITH TWO POTASH SHAFTS operating and having delivered 25,000 metric tons of potash for domestic spring fertilizing this year, the Russian potash industry is reported as planning to increase deliveries to 1,000,000 tons in 1932. Three refining plants are in sight, one to be done this year, while another shaft is contemplated. The production program four years ahead is as follows, in metric tons:

| | |
|------------|-----------|
| 1932 | 1,000,000 |
| 1933 | 1,800,000 |
| 1934 | 4,500,000 |
| 1935 | 6,000,000 |

Construction work is delayed now because of lack of material, equipment, and labor, and is made more difficult by the remoteness of the location in the Solikamsk area. The Soviet Superior Economic Council is trying under pressure to provide necessary supplies.

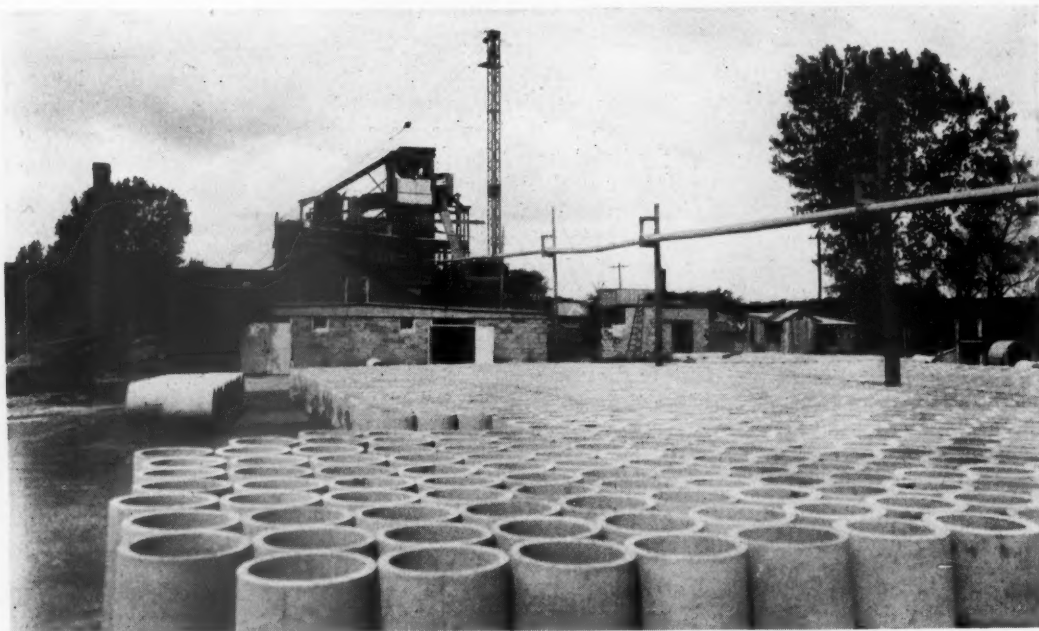
The transportation problem is still perplexing, and the building of a potash-loading harbor at Solikamsk is but the beginning of the solution of this problem.—*Trade Commissioner Wm. T. Daugherty, Berlin*.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Lake View Concrete Tile Co.

Has Developed Its Own Facilities for Producing Sand and Gravel at Lake View, Iowa



Storage yard and products plant, with dragline tower and washing plant in background

THE Lake View Concrete Tile Co. of Lake View, Ia., was established in the town of Early, Ia., in the year 1904. In 1913 the plant was moved to its present location, principally because at that site was an abundance of good sand and gravel which could be economically recovered and delivered to the new plant.

In the rock products industries there are many operations where a concrete products plant was later established as a sort of side line and as a possible outlet for aggregate. In this instance, however, we have a concrete products plant which installed its own equipment to recover aggregates, running the sand and gravel end of the business as the side line. In other words, by far the greater activity of this company is in the production of concrete products rather than the attempt to sell sand and gravel as raw materials. The equipment could supply up to 90 tons of aggregate per 10-hr. day, as the $\frac{3}{4}$ -yd. Link-Belt slackline cableway could readily dig that amount and deliver it

to the plant; but this was not the object of the company, so only a small washing plant was installed, sufficient to easily take care of the needs of the products plant and leave a little margin for local sand and gravel sales.

At Lake View are two other large sand and gravel producers, the Northwestern Gravel Co. and the Le Grand Limestone Co. The latter company has a quarry at Le Grand, Ia., from which it derives its name, but its operation at Lake View is a sand and gravel plant. These two producers can load in the neighborhood of 700,000 tons per year, practically all of which is shipped by rail, leaving considerable of the local truck and wagon trade for the Lake View Concrete Tile Co., an arrangement which has worked out quite satisfactorily.

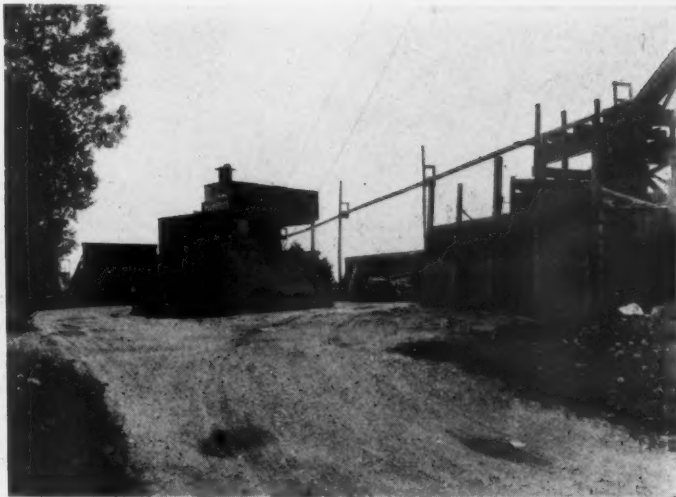
The concrete products industry in Iowa during good or normal building years is a remarkably large and fertile industry, as the state is not overly supplied with natural building stone, but does have plenty of good

sand and gravel as well as good cement. In recent years the sale of concrete building block has slumped considerably and manufacturers who are on their toes scurried around for something worth while to manufacture during the off building years. Some chose ornamental objects, septic tanks, well curbing, burial vaults, etc., but C. C. Wetzstein, president of the Lake View Concrete Tile Co., concentrated on drain tile, especially the tile of larger diameter. He does sell many other concrete products, however.

Iowa is a farming state practically 100%. Until recent years the countless farms were served by dirt roads, but in the past few years Iowa has been rapidly getting out of the mud until we find today that it is possible to traverse the state readily in almost any direction during any season and during any type of weather over excellent concrete and graveled roads. The country being more or less flat, and to afford drainage for the roads, the beds of the highways have been graded up several feet higher than the ad-



Screening and washing plant, with pipe to carry away waste sand



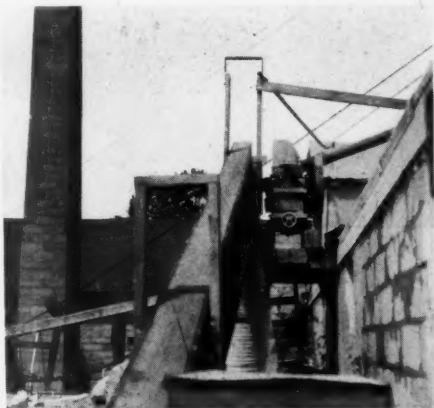
Steam drive for slackline cableway is housed in this structure

joining farms so that in getting a road from the farmer's home to the highway a "dip" has to be made or some sort of a drain installed and the road built on top of the drain. This use for concrete tile has taken a surprisingly large footage of that material; and as this year, as well as 1930, were excellent years as far as highway construction was concerned, it is again not surprising to find that concrete products plants



This 3/4-yd. bucket supplies the plant with sand and gravel

Appearance of the product, and appearance of the plant making the product, are also factors in its selling. Neatness and orderliness of the office and plant, things that make a favorable impression on a prospective customer, are also sales assets utilized to the "nth" degree by this company; for seldom does one see industrial plants kept up in the manner that the director of this company keeps up his plant and its surround-



For crushing oversize

producing these units were working at only a little less than normal capacity.

The capacity of the plants in the state for making these tile is in considerable excess of the demand, so that production problems are relegated to the background, to be replaced with the problem of sales. Everyone is interested in how the other fellows sell.

In the first place, Mr. Wetzstein makes a good product and tells the world about it by judicious advertising—local newspaper advertising and direct mail circularizing.



Curing tunnels



Where concrete block are molded



Car from which mixer is fed

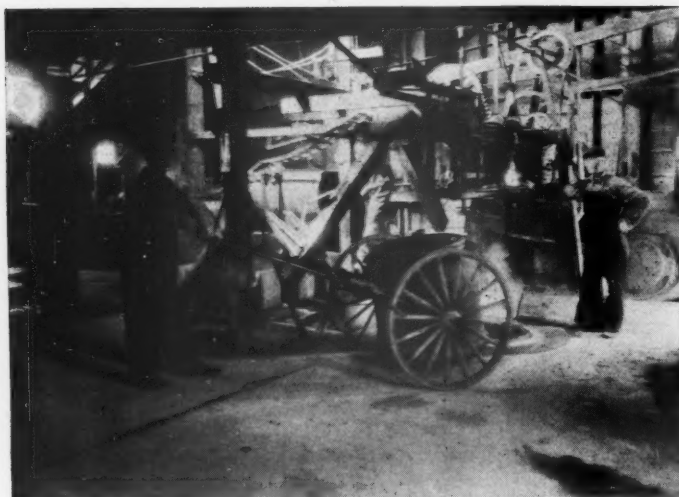


The plant as seen from the river

size and chutes them back to the pit where they are reclaimed by the Link-Belt drag-line.

For the manufacture of small tile a 1 to 3 mixture is used entirely without any coarse aggregate. The larger sizes of tile have coarse aggregate incorporated into them in amounts that depend upon the type of tile manufactured. In any event the amount of aggregate is regulated so as to give a good strength test, as well as to give a pleasing appearance.

The larger tile are all made on a National machine and are allowed to cure inside for four days, after which they are moved outside and sprayed with water from a hose from time to time. The smaller tile in the summer are treated similarly, but in cold weather they are cured in the steam tunnels which also are used to cure the concrete block. In warm weather the block are cured the same as the larger drain tile,



Making large pipe for highway culverts



Interior of the shop

ings. Then, last but not least, the producer must be able to meet the competition of price cutters by producing a good product at a minimum of cost. That probably is the important factor in this company's success.

In a few hours of operation, one man, by the use of the slackline cableway excavator, can dig the sand and gravel, delivering it to the washing plant which is located over the bins serving the various tile fabricating units, in sufficient quantity to last several days. The excavator has a 70-ft. mast, sufficiently high to allow plenty of head room for the simple washing plant and the bin structure. The unit is powered by an 8 by 12, 50-hp., double drum, Mundy steam hoist using a 1½-in. carrying line, a 5⁄8-in. return line and a 3⁄4-in. load line. The drive unit is housed in a neat structure of concrete block of the company's own manufacture.

After the sand and gravel has been washed and screened in small rotary washers it falls to bins which in turn supply the various machines in the plant below. Any excess sands are flumed to waste through

an overhead pipe, where the sand is deposited back in a worked-out portion of the pit. Any large oversize falls to a jaw crusher, which reduces the boulders to aggregate

that is for four days inside but without steam.

The plant is equipped to make drain tile from 5 in. in diameter to 48 in., as well as



Machines for making smaller tile



Storage yard for smaller sizes of tile

building block, culvert pipe, well curbing, septic tanks, etc. Anchor machines are used for the manufacture of building block, there being two units, both of which are hand fed from the mixer.

The plant can be said to be divided into two production units; on one side the large diameter drain tile are manufactured and on the other side the block and smaller diameter tile are fabricated. A 3-tile Monarch is used for the medium sized pipe and a 6-tile Monarch for the smaller sized. These two machines are fed by a drag conveyor that receives its feed from a 9-cu. ft. Blystone mixer.

The aggregate for this machine as well as the bagged cement are loaded onto a two compartment skip-car which is pulled up a short incline and discharges to the mixer. From this mixer the material can fall to a second drag conveyor serving the two Monarch tile machines, or can discharge to the floor where the mix can be hand shoveled to the block machines.

On the other side of the plant is the machine for making the 48-in. tile. This machine is fed from a separate 9-cu. ft. mixer and drag conveyor. The drag conveyors

were supplied by the Quinn Wire and Iron Works, Boone, Ia.

The concrete block in the storage yard are loaded to trucks and transported to cars via an industrial track which is inclined at the far end to a point sufficiently high to come up even with a standard-gage box car. A rejuvenated "flivver" is used for haulage power.

The office of the company is at the plant and is constructed of concrete block. Plastering was done directly on the block and it was said that no moisture had ever come through the walls. The building is modern in every respect, equipped with wash room and toilet, steam heated from a central heating plant located in the fabricating plant, and being totally covered by a luxurious growth of ivy vines, it presents a pretty picture in itself.

C. C. Wetzstein is president and general manager; Miss Irene Ross is treasurer and office manager, and Merrill Thorpe is general foreman.

Iowa Products Company in Bankruptcy Court

A PETITION in involuntary bankruptcy has been filed in federal district court against the Davenport Concrete Products Co., Davenport, Ia.

The action was started by Fred Danger, city council member and coal dealer, who holds three claims against the concrete products firm for principal and interest on promissory notes.

Although it is usually required that at least three creditors unite in such a procedure in federal court, it is said that inasmuch as there are claimed to be less than twelve creditors, that one may instigate the action.

It is alleged that the company committed an act of bankruptcy when it paid the Northwest Davenport Cement Block Co. \$157.22 on a court judgment of \$259.08.—*Davenport (Ia.) Times*.



The ivy-covered office

Ready Mixed Concrete Studied by Many Agencies

AN AGREEMENT as to a division of work on the study of ready mixed concrete was reached between committee chairmen representing several associations at a recent meeting in Chicago. This meeting was attended by the association representatives who divided up the work as follows:

American Road Builders' Association—the study of equipment and construction methods for roads and streets;

American Concrete Institute—uses other than roads and streets;

American Society of Testing Materials—specifications for materials;

National Ready Mixed Concrete Association—utilization of data by industry.

At a meeting of ready mixed concrete machinery manufacturers called by the American Road Builders' Association in Washington to discuss the work of the year, the scope of the studies was outlined. The work of the American Road Builders' Association will be conducted this year in cooperation with the National Ready Mixed Concrete Association.

One of the principal studies will be a satisfactory means of depositing the product from the hauling unit to its proper place on the subgrade.

Vermont Products Manufacturer to Increase Capacity

THE CEMENT BLOCK manufacturing plant of Thomas Reeves and son of which Mrs. V. G. Reeves has been proprietor, was purchased July 20 by Alfred Perrotta and Charles Papin. The plant opened immediately under the new management.

New machinery is to be installed both for the manufacture of cement blocks and cement bricks while experimental work will be carried on with tiling. With the installation of modern apparatus the daily output will be 10,000 cement bricks while the output of cement blocks will be doubled. Greater daily production will result in a reduction in price on the finished product. These bricks will be manufactured in a variety of colors and are used in both chimney and wall construction.—*Burlington (Vt.) News*.

New Ready-Mixed Plant for St. Louis District

AN ADDITIONAL central mixing plant for the production of Red-D-Mix concrete was recently placed in service at National City, Ill., by the General Material Co., of St. Louis, Mo.

This new plant contains a 2-yd. mixer and will be known as the East Side plant. It is midway between East St. Louis and Brooklyn and so located that the whole East St. Louis district can be served with moderate hauls.

Closed-Circuit Grinding As An Engineering Problem

By J. S. Vrabek

Vice-President, Sturtevant Engineers, Inc., Boston, Mass.

MOST EXECUTIVES and most plant operating heads know how to operate machinery to produce the product desired. Most operating officials and plant engineers know how to get the most out of machinery at their command. Unfortunately, very few plant executives know and fully appreciate that the operation of machinery as it is now on hand and arranged is one thing; that to be positive that this equipment and present arrangement are the most economical is quite another thing. Still more unfortunately, those whom they depend upon for mechanical knowledge do not always grasp the larger outlook that the chief end of business is profit, not merely operation.

Where the executive of the business judges and passes upon recommendations with net profits in mind, others may and usually do have in mind simply mechanical operation. The result has been much equipment bought and operated mechanically efficiently, but commercially inefficiently. This has brought about waste—if not of money, then of opportunity. And business has seen the spectacle of "profitless prosperity"—plenty of business done, but meager profits made.

There are thousands of plant-operating organizations that can and do perform well, and even brilliantly with the equipment and "hook-up" at their disposal. Others, not so naturally endowed, are at best working under a grind that tends to increase rather than diminish. They know and will frequently state that they cannot depend regularly upon their equipment to operate continuously at low unit cost, and thus keep pace with the downward tendency in selling prices enforced by today's highly competitive markets. This is an unfortunate situation but is due not to any fault in plant manage-



J. S. Vrabek

ment and operation at which many, and indeed most plants, excel, but in the lack of guiding principles of commercial engineering.

It is perfectly possible to fill the buildings of any mill or plant with the finest and most modern equipment known, and to run

these machines individually at capacity—without producing any operating profit. It is perfectly possible to take ordinary equipment in use for some years, and by scientific assignment of the right machine to the right task, and by scientific hook-up, to knit together the whole into a unit that operates as efficiently as a typewriter under the fingers of a skilled operator—and makes profits that to many seem spectacular.

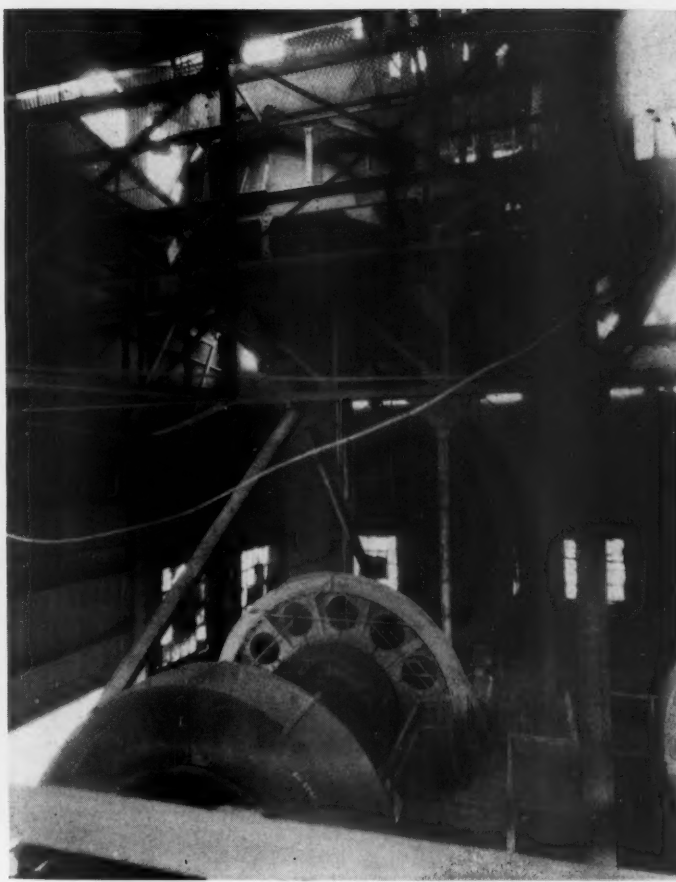
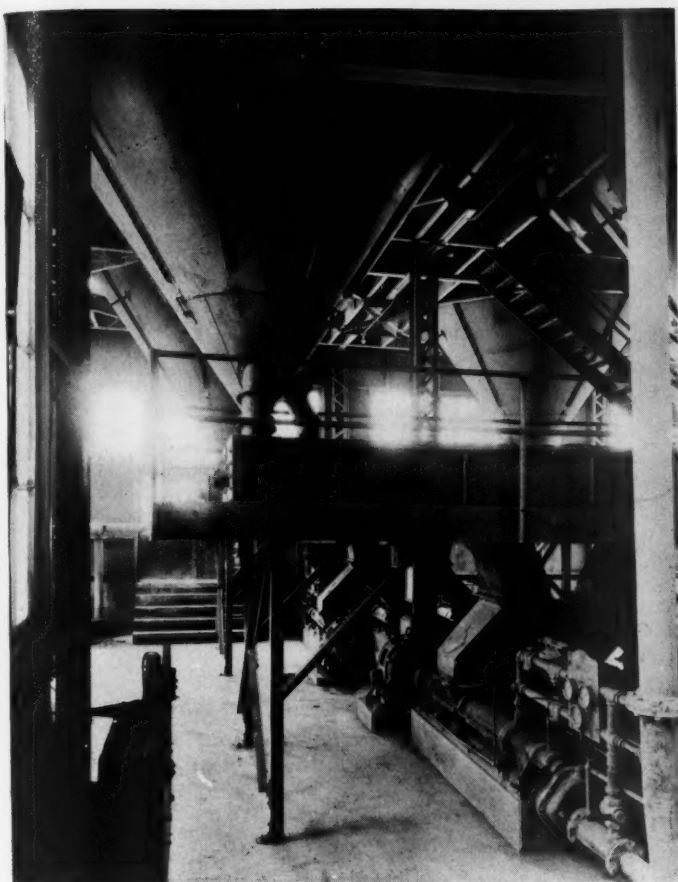
Principles of Grinding in the Cement Industry

Sturtevant engineers have followed the process of making portland cement almost from its inception to present-day practice. Few industries have undergone more numerous or drastic changes in methods or equipment used, and even today the grinding process cannot be termed standardized, although it performs a most important function. Tube mills, however, predominate, either of the unit or compartment type, the latter seldom requiring a preliminary grinder. At other times, particularly on raw material, several types of preliminary grinders are utilized for the first reduction, followed by a tube mill or other finishers. With the advent of closed-circuit grinding meth-

ods, for both raw material and clinker, came the utilization of separators (screen and air) for greatly increased capacities, more uniform and finer outputs, and to gain the advantages of high early strengths by focusing the attention of the chemical department on changes of the raw material mix plus the necessity for further studies in terms of effect of particle size control to the kilns; the intensity of harder burn and the ability of carrying a high lime ratio; all of which is a step in the direction of ability to grind finer on the clinker side and in many cases enable one to obtain



Air separators attached to hammer mills



Two cement plant installations

high early strengths in a cement by increasing the percentage of fines between a given range of microns rather than by increasing the fineness of the "impalpable powder" beyond a certain micron limit that has little effect, if any, on the final product.

The application of this new method resolves itself into strictly an engineering proposition involving specific knowledge of the cement manufacturing process from both a chemical and a physical standpoint. It necessitates a practical operating experience with the various types and makes of tube mills as well as all preliminary machinery; for, to accomplish the purpose successfully, a perfect balance must be reached and maintained between all equipment within the closed-circuit cycle.

The amount of feed, the circulating load, the percentage of fines in the product (and in the separator tailings returned) of each contributing machine; the ball load and sizes of grinding media in the tube mills, the grids in division heads, and the screens in the pulverizers, all have to be predetermined to accurately gage the results to be expected. For super-strength cement even the heat of grinding must be lowered.

Few engineers have had the unusual opportunity of operating and observing all of this equipment in more than 100 cement plants and in fully an equal number of other industries using similar machinery for similar purposes. The experience of fine grinding in feldspar, silica, quartz, flint, slag, limestone, phosphate rock, etc., adds greatly to operating knowledge. Every new prob-

lem is an incentive to create, to achieve reputation, to win new laurels. Our intelligent curiosity probes into every part of the operation or process; the facts which we find are combined with experience in perhaps 500 similar situations—and from this combination come ideas and plans combining all, and more likely better than any preceding.

There are few industries using pulverizers that cannot benefit by the closed-circuit method of grinding. It is old in some industries and a new and untried process in others, yet the principle involved is equally sound whether wet or dry reduction is practiced or whether the business be metal mining or cement manufacture—whether the product be coarse or fine—metallic or non-metallic. There are those who do not understand the process or the principle involved in closed-circuit grinding; there are others who do not appreciate all its advantages, and there are still others who know about it and are using it to full advantage and to their great profit. It is of sufficient importance to warrant digging deep into the subject for the benefit of those who are not thoroughly conversant with every detail of its almost unlimited possibilities.

Open-Circuit Grinding

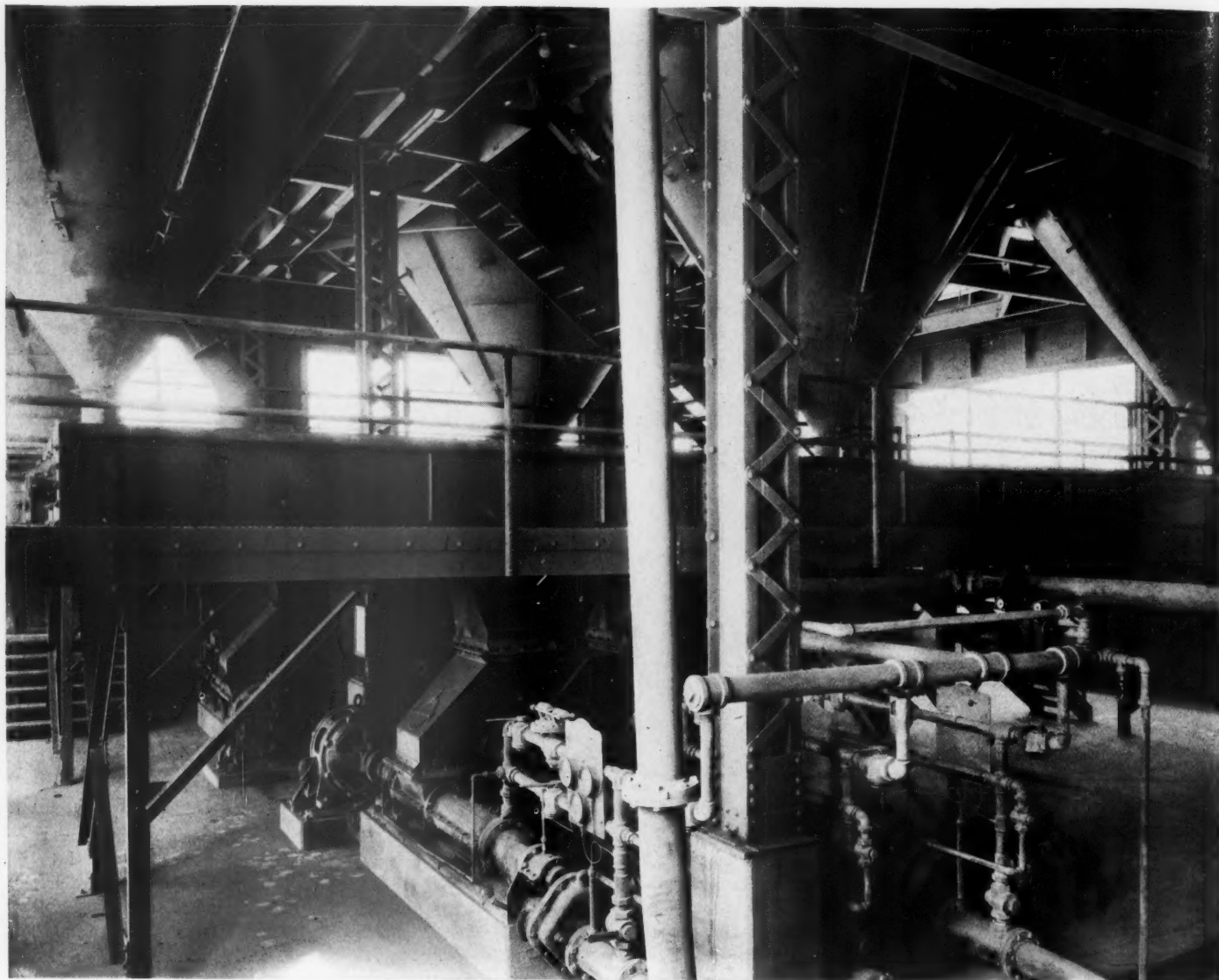
To show the difference between open- and closed-circuit grinding it is first necessary to briefly describe the old process of open-circuit grinding, which has been the standard practice for generations.

Open-circuit grinding, sometimes known as one passage grinding, requires the pulverizer to finish all the material fed to it in one passage through. This is the principle used in the old millstones, tube mills, roller and ball mills, whether using internal screens or not. All these mills are required not only to grind but also to size within the mill, discharging only when the material is reduced to the finished state.

Such a method necessitates that the pulverizer grind to a finish the entire amount fed to it, therefore the amount fed must exactly equal the amount discharged, for otherwise, if fed too fast the product would be too coarse and the mill would become "plugged." If underfed, the output would be finer than necessary (over-ground). Under such circumstances, when estimating the feed rate, one must take into consideration the physical characteristics of the material being ground, its size, hardness, toughness, moisture content, etc., for if any of these vary, so will the capacity and the fineness of the output vary.

If a tube mill is fed with material 90% of which will pass a 100-mesh screen and 10% of it 4-mesh, and if the product desired be 100-mesh, then the feed must be adjusted so that the 10% of 4-mesh particles will be ground to 100-mesh before any material is allowed to discharge. That proportion which is already fine enough cannot readily escape until the 10% of 4-mesh is ground to a like fineness.

It is obvious from this example that more than 90% of the grinding ability of the mill



Air separators in connection with a pneumatic pumping system

is penalized, for that same 90% of fines is a direct hindrance to the effective action of the pebbles or balls which are cushioned, coated and obstructed by these confined fines that cannot escape. This inefficiency is reflected in curtailed output, in excessive wear, power consumption, investment and the floor space occupied by several mills whose work could be duplicated by one efficiently-operated mill.

As mentioned above, it is necessary in open-circuit grinding that the feed rate and the discharge rate be exactly equal; if not, then any inequality in the material fed is immediately reflected in the fineness of discharge. If the physical characteristics of the material fed vary in the slightest degree the feed rate must be instantaneously changed to counteract this condition or the quality of the output will vary accordingly. The only method of correction of the variables is to make constant screen analyses of the discharged product and modify, by regulation, the feed rate. These all take time and labor so that quick corrections are not practical and usually result in the op-

erator's underfeeding the mill, to be sure of his fineness, with the result that the output is penalized and the material is ground finer than necessary—a direct charge against cost of production.

There are many other factors unfavorable to open-circuit grinding but the above seem sufficient to convince the most skeptical that this method is not efficient—in fact it is grossly inefficient—and if there is a better method, it should claim the serious attention of every intelligent operator of pulverizing equipment.

Closed-Circuit Grinding (with a Separator)

There is a better method—one proven beyond the shadow of a doubt, both in theory and in practice, to be far superior to the old and now obsolete practice of open-circuit reduction.

Closed-circuit grinding may be defined as that method of reduction in which the pulverizer is operated in closed-circuit in connection with a classifier (wet, dry, air or screen), in which case the mill is not

required to finish to the desired fineness, in one passage through, all of the material fed to it. The responsibility for sizing rests entirely with the classifier; the only duty of the mill is that of pulverizing. The total discharge from the mill (coarse and fine) passes through the classifier, which selects that portion that is of the required fineness, rejecting and returning to the mill that which is not fine enough, with the fresh feed, for further reduction. That portion of the mill discharge which is not sufficiently ground and is thus rejected by the classifier and returned to the mill for regrinding is termed the "circulating load." That is a definition we should remember.

Under the old "open-circuit" method wherein the mill was required to finish the exact amount fed to it, the feed rate was precisely limited to the ability of the mill to grind the hardest, or largest, or toughest, or dampest particles. Under the modern "closed-circuit" method the full ability of the mill is used to grind and grind only; it need not finish (once through) 100% of its feed. The circulating load may be—and it

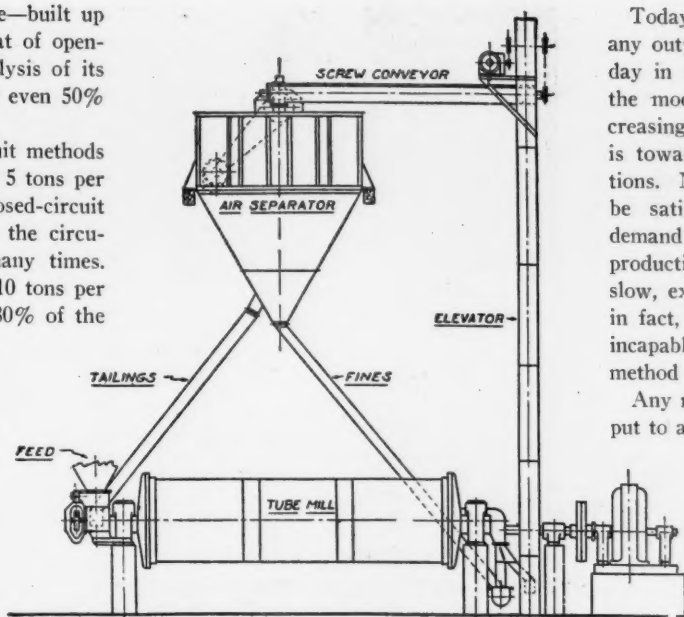
is most desirable that it should be—built up to an amount of several times that of open-circuit feed, or until a screen analysis of its discharge shows but 80, 70, 60 or even 50% of the desired fineness.

This means that if by open-circuit methods the feed and the discharge rate is 5 tons per hour of finished product, by closed-circuit methods this feed rate, including the circulating load, may be increased many times. For instance if it were doubled (10 tons per hour) and the mill ground only 80% of the material passing through, then the capacity would be 8 tons of finished product instead of the 5 tons obtained by open-circuit methods.

Again: If the feed rate, plus the circulating load, were increased three times (15 tons) per hour and the mill ground only 70%, then its output would be 10½ tons per hour, as compared with the original 5 tons. This would require no more power, with the exception of that required by the classifier installation, which is a small percentage of the mill power. Perhaps, to some persons, stepping up the circulating load three times, or 300%, seems impracticable, but let us say that cases have been tried where 1000% increase in circulating load has shown economical results.

To illustrate the inefficiency of open-circuit grinding we show a grinding diagram of a tube mill—a standard 6-ft. by 26-ft. tube mill operating under old "open-circuit" methods is used as an example. The graph will clearly show the relative pulverizing effect upon the material at each foot of length traversed. Please take careful note that 60% of the grinding is accomplished in the first 2 ft., 75% in the first 4 ft., 85% in the first 6 ft. and 90% in the first 8 ft., and the balance of the tube mill length (18 ft.) is used to finish 10% of the material fed. In other words 30% of the mill's length is doing 90% of the grinding while 70% of the length is grinding only 10% of the material.

It is not difficult to forecast the result if 18 ft. of the tube mill were cut off and the first 8 ft. only used in "closed-circuit" with a classifier. If the 26-ft. mill ground 10 tons of material per hour, then the 8-ft. section would grind 9 tons, 70% of the mill power would be saved and a similar percentage of upkeep, floor space, etc., would be conserved. But why stop there? Increase the feed and build up the circulating load of the 8-ft. section until it finishes only 70% of its feed instead of 90% as formerly, and its output is immediately increased to an amount equal to 70% of the entire feed, including the circulating load. Thus if these loads were doubled (20 tons per hour) then the mill capacity would be stepped up to 14 tons per hour (0.70×20). The only additional power would be that taken by an elevator and air separator (approx. 25 hp.).



Closed circuit unit with tube mill and air separator

The tube mill need not be cut off to work efficiently, for by using it as is and increasing the load to be pulverized and by not requiring that the mill finish within itself, but only grind (depending on the separator to regulate fineness), the entire character of the graph will be changed and the efficiency will be distributed much more evenly throughout the entire length of the mill.

Reviewing the Argument

Now to retrace our steps. It has been shown that any mill operating in open-circuit is limited in output by its ability to finish, to the required fineness in one passage through, all of the feed given it. It has been shown that it is not possible to regulate its fineness within close limits because of the varying physical characteristics of the material being fed; and that to obviate errors and be sure of his fineness the operator underfeeds to counteract physical differences in the material and thus overgrinds and penalizes output. To change the quality (fineness or coarseness) of this product, the operator must readjust his feed to meet the new conditions, and if he is compelled to grind to extreme fineness, beyond the commercial ability of the machine to finish within itself, his output falls off to a negligible quantity, the cost of which makes it impracticable.

Today the control of quality (fineness) in any output and the assurance of this quality day in and day out (uniformity) to satisfy the modern demand, are of great and increasing importance. The trend of industry is toward finer and finer product specifications. No longer will purchasers, or users, be satisfied with a variable result—they demand accuracy and uniformity and large production. Old methods are inadequate, slow, expensive, inaccurate and nonuniform; in fact, for the finer specifications, they are incapable of production. The closed-circuit method meets all these conditions.

Any mill will produce a portion of its output to any fineness and the modern separator will classify its product and take out the fines to any reasonable mesh and do it accurately, uniformly, and reliably, day in and day out. Whether the mill furnishes 90% or only 10%, that part of the product wanted, whether 60-mesh or 350-mesh, is removed, separated from the coarser particles and reclaimed. The balance (rejects) is reground, and it is of no consequence whether or not this unground or partially ground oversize passes through the mill a dozen times before it is finally reduced to satisfy the finished requirements, for it will eventually be ground and removed by the classifier with no handicap or penalty to the pulverizer.

Thus the principle of closed-circuit grinding is to utilize two separate, independent machines but in close cooperation with each other. The function of the first is to grind and grind only to maximum capacity, unhindered by cushioning fines, or by overgrinding, unhandicapped by the withholding of fines awaiting the reduction of coarser particles before discharge, unhampered by restricting its output to a definite mesh, without the handicap of plugging, wearing, internal screens to baffle its effectiveness.

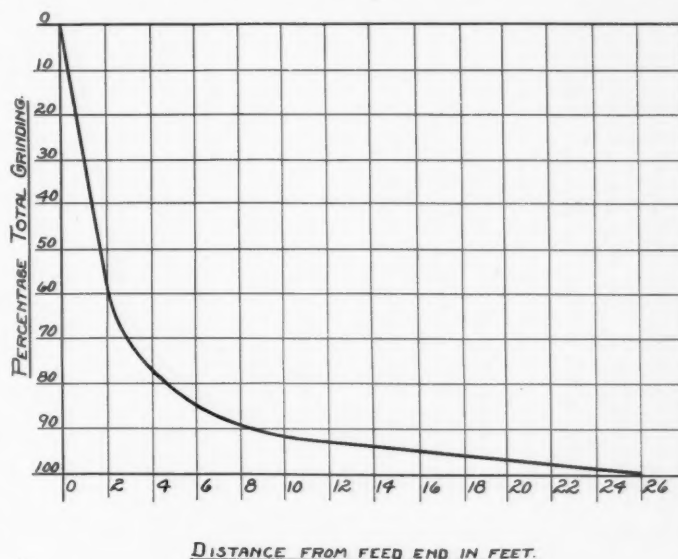
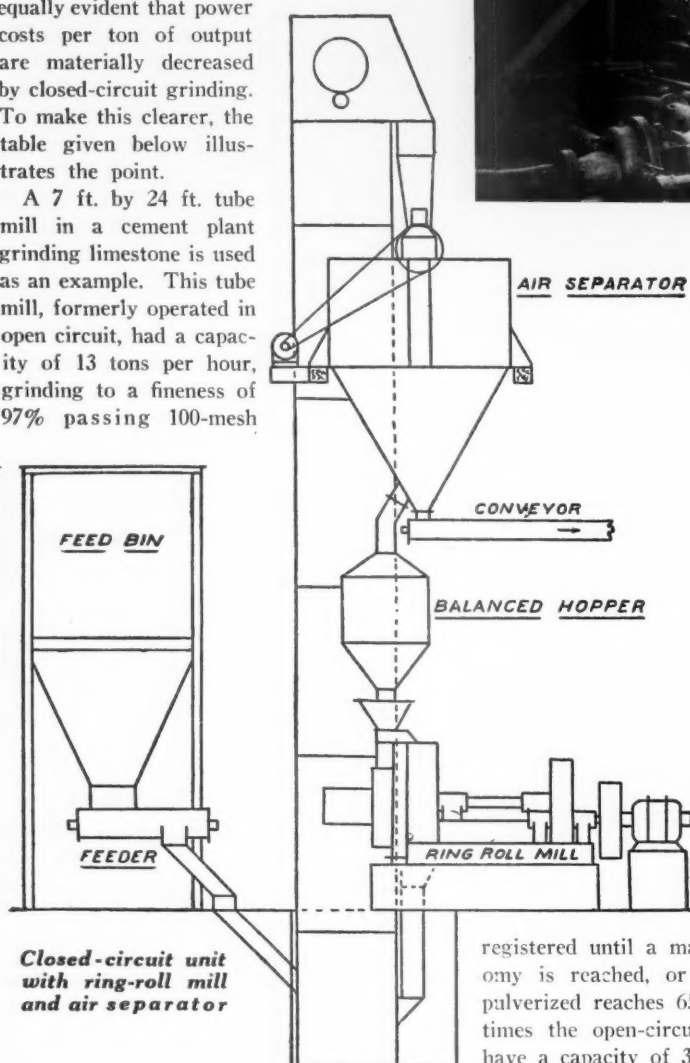


Diagram of open-circuit grinding in a tube mill, showing that 75% of the work is done in first 4 ft. of mill

The other, a separator, a machine built to separate only, large enough to handle any reasonable circulating load, is a machine whose output is unaffected by coarse particles, or load, or usual dampness, or amount of fines in the material fed to it—a separator which is subject to quick and accurate adjustment for modifying products within a wide range. A separator or classifier which requires no attention is very durable and requires a small amount of power. We, therefore, have a pulverizer and a classifier connected, combined and functioning as a balanced unit of great flexibility.

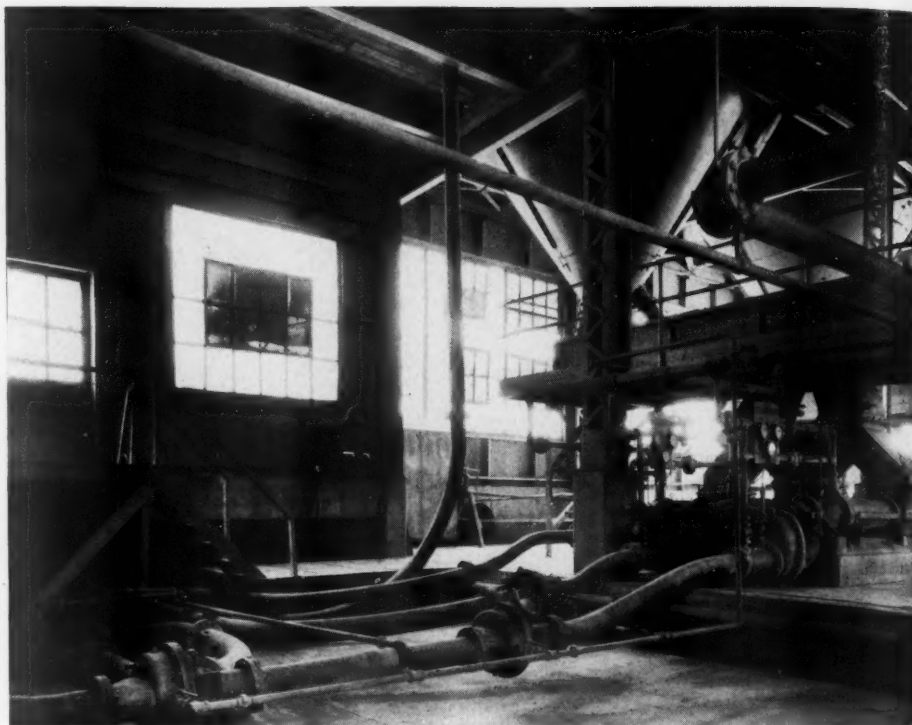
Great increase in capacity is evident and as this is accomplished at no increase in power used, except that caused by the addition of the separator installation, it is equally evident that power costs per ton of output are materially decreased by closed-circuit grinding. To make this clearer, the table given below illustrates the point.

A 7 ft. by 24 ft. tube mill in a cement plant grinding limestone is used as an example. This tube mill, formerly operated in open circuit, had a capacity of 13 tons per hour, grinding to a fineness of 97% passing 100-mesh



Closed-circuit unit with ring-roll mill and air separator

with an expenditure of 500-hp. as represented by the first line in the table. The other items illustrate the output and power used by the same tube mill grinding to the same fineness in closed-circuit with a selector. It will be noted that by doubling the circulating load (from 13 to 26 tons) the mill discharges a product of which only 90% is of the required fineness, but we have passed through the system twice as much material in the same time, i. e., at twice the



Another pneumatic installation

speed, with the result that the total output of finished product is 23.4 tons instead of 13 tons as formerly finished by the open-circuit method; and even though we have the added power of the selector unit (45-hp.) our power per ton of finished output has dropped from 38.4 to 23.3 hp.—an increase of capacity of 10.4 tons per hour and a power saving of 15.1 hp. per ton.

It will be noted that by further building up the circulating load a progressive increase in output and decrease in power is

registered until a maximum resulting economy is reached, or when the load to be pulverized reaches 65 tons per hour or five times the open-circuit feed rate, when we have a capacity of 39 tons per hour with a

total power expenditure of only 13.9 hp. per ton. This shows an increase of 26 tons per hour in output or three times that obtained in open-circuit (13 tons) and a power saving of 24.5 hp. per ton of output, approximately only one-third of the power used in open-circuit.

Again note that the next increase of circulating load shows no saving in power and no increase in output, therefore, there is no advantage in further building up the circulating rate.

These figures are enlightening, for while they are theoretical and based upon selector efficiency of 100%, yet in actual practice it is safe to say that one may count upon a minimum increase in output of 50% and a maximum of 200%, depending upon the equipment used, the material being ground, the fineness desired, and the plant arrangement.

The advantages gained are: (1) large increase in output; (2) accuracy and uniformity of product; (3) fineness of product; (4) complete control of output; (5) labor saving, as neither mill nor separator require attention—they are automatic.

There is another very important advantage involved in closed-circuit grinding and

THEORETICAL TABULATION OF CLOSED- VS. OPEN-CIRCUIT GRINDING ASSUMING THAT SELECTOR EFFICIENCY IS 100%

| Tube mill size | Hp. mill only open circuit | Hp. mill only closed circuit | Additional power selector unit | Total power | % fines in mill discharge | Cir. load tons per hour | Finished output tons per hour | Power per ton of output |
|---------------------|----------------------------|------------------------------|--------------------------------|-------------|---------------------------|-------------------------|-------------------------------|-------------------------|
| 7 ft. by 24 ft..... | 500 | ..... | ..... | 500 | 100% | 13 | 13 | 38.4 |
| 7 ft. by 24 ft..... | 500* | 45 | 545 | 545 | 90% | 26 | 23.4 | 23.3 |
| 7 ft. by 24 ft..... | 500* | 45 | 545 | 545 | 80% | 39 | 31.2 | 17.4 |
| 7 ft. by 24 ft..... | 500* | 45 | 545 | 545 | 70% | 52 | 36.4 | 15. |
| 7 ft. by 24 ft..... | 500* | 45 | 545 | 545 | 60% | 65 | 39. | 13.9 |
| 7 ft. by 24 ft..... | 500* | 45 | 545 | 545 | 50% | 78 | 39. | 13.9 |

*The power, in practice, actually lessens as the circulating load increases. This is owing to the rapidity of the material's passing through the mill, there being a less load in the mill at any one time.

that is the cooling effect of large circulating loads passing through a grinder and selector. Heat generated by the crushing effect and also by the friction of the grinding media is quickly dissipated by the great volume and steady flow of the material rapidly passing through the system. The cooler the mill, the less the upkeep and power. In the reduction of cement clinker by closed-circuit methods the heat is reduced from 50 to 100 deg. F. Moisture is reduced in a similar manner and much damper materials may be ground in closed-circuit than in open-circuit, especially if an air separator is used.

There is one more point well worth consideration. A mill operates with less power under closed-circuit methods than by open-circuit processes for the reason that the material is not allowed to accumulate within the grinding chamber; it is rushed through at a high rate of speed and discharged freely; therefore, there is a less amount in the mill at any one time. This is particularly true of tube mills, and of the roller or hammer types which use internal screens or close grate spacings. With the latter types much coarser screens or wider grate spacings are used to hasten and ease the discharge, and no attempt is made to require the mills to finish all the material within themselves.

Applications of Closed-Circuit Grinding

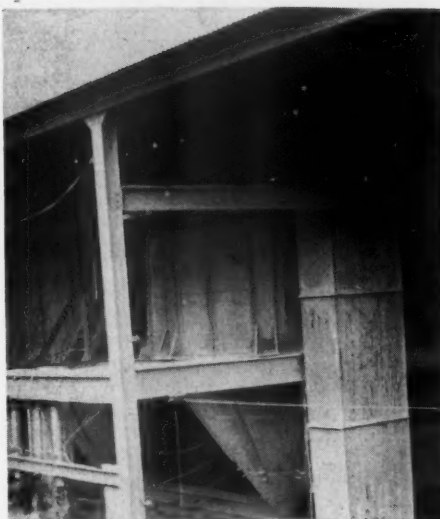
Now a word in reference to another application of closed-circuit grinding. Most finishing mills require a preliminary grinder to give them a feed upon which to work most effectively. This preliminary grinder may be operated in closed-circuit with a classifier, independently, or in connection with the finishing mill. Each may use the same classifier or each may use a separate classifier, depending upon the result desired. For instance, if a hammer mill is used as a preliminary grinder to a tube mill and the final output of the tube mill is to be 100-mesh, then one of four methods can be used:

1. Hammer mills are noted for their ability to produce a large percentage of 100-mesh on the first "break." They can grind to 80% or 90% of 20-mesh economically, but finer than this they cannot successfully finish their own tailings. Therefore, to take advantage of the fines produced, they may be very effectively operated in closed-circuit with an air separator which will remove the 100-mesh material made by them and thus relieve the tube mill of the waste effort of over-grinding what is already sufficiently reduced. The amount of "fines" made by the hammer mills and reclaimed from the system is clear "velvet"—an inexpensive increase in plant output.

2. By using the same separator in closed-circuit for both hammer and tube mill.

3. By the use of an independent separator for each mill.

4. By using a screen and separator after the hammer mill; the screen to give the separator a product of 16-mesh and finer,



Tube mill operating in closed circuit

from which it removes the 100-mesh and finer, returning the rejects (16-100-mesh) to the tube mill, the rejects from the screen (plus 16-mesh) returning to the hammer mill for further reduction.

The same air separator can be used also for the tube mill. In such an installation the hammer mill grinds to 100% through 16-mesh in closed circuit with a screen and at the same time the 100-mesh is reclaimed from its product. The air separator rejects (minus 16- plus 100-mesh) are an ideal feed for the tube mill, and the latter working in closed circuit with the same air separator is itself working most effectively. Similar installations can be made with other preliminary grinders. It is just a question whether they make sufficient finished fines to remove at that stage, or whether a combination of air separator and screen layout is desirable. With the facts available it is easy and simple to ascertain the most economical method to adopt. In any case closed-circuit operation can probably be used at great profit.

Let us again stress the fact that while closed-circuit grinding is simple in both theory and effect, it is most desirable that it be approached in the light of engineering experience and knowledge because, like every other grinding process, there is a right and wrong method of application. Great circulating loads are a necessity sometimes; correct balance is imperative always; and all auxiliaries must be of proper proportions and properly adapted to allow free and even flow of the material and correct blending of the new feed with the circulating load to that of the pulverizers so that the most advantageous and profitable results can be looked for. The air separator in itself is but a means to an end; it is a cog in the wheel traveling toward the achievement of a definite purpose. It will become an asset or a liability in direct proportion to the amount of engineering knowledge and experience given to the study of its application, and results to be expected.

Iowa Prison Quarry Competes with Private Operators

THERE ARE TWO large stone quarries in Van Buren county, Iowa, both of which in 1930 furnished employment for a number of men.

The quarry of the Douds Stone Co. is working this year at about half its capacity, and the quarry in Farmington township is not operating.

The business of these quarries has to some extent been hampered by direct competition of the state prison quarry at Croton. This quarry is operated under the direction of the state board of control, about \$100,000 worth of machinery has been installed, and convict labor is used.

There should be no objection to the operation of the Croton quarry if the product thereof were confined to the construction of state buildings, but it does seem unfair to allow the state quarry to enter into the open market, prison labor thus entering into competition with the labor of Van Buren county people and causing its quarries to remain idle or run at half time.

It is said that the opening of a large gravel plant at Farmington is also delayed to some extent by this manifestly unfair competition.—*Bonaparte (Ia.) Record*.

Start New Gravel Firm in Illinois

INCORPORATION papers have been issued to the Kingston Lake Gravel Co. of Bloomington, Ill., of which George N. Childs, Judge James C. Riley and Ragna Solem are the stockholders and officers.

The office of the company will be in Bloomington, from which Mr. Childs also handles concrete road building operations, but the site of the company's work is at Kingston lake, on the west side of the Illinois river five miles from Pekin. The company is working at capacity with 96 acres of 35-ft. deep gravel from which it is screening its output and loading it on 14 barges which ply the Illinois river under the power of two steamboats, one of the boats the largest on the river.—*Bloomington (Ill.) Pantagraph*.

Arc Welding Competition

THE Lincoln Electric Co., Cleveland, Ohio, is running a second competition with prizes for the best papers on the application of arc welding to industry. Full information regarding the contest and data regarding the arc welding process may be had from the company upon request. All manuscripts must be in by October 1, 1931, and cash prizes will be awarded for the forty-one best papers submitted. The purpose is to bring out more information and arouse more interest in the adaptability and advantages of the arc welding process in the redesign of machinery and equipment.

New Machinery and Equipment

New Manganese Electrode Utilizes Shielded Arc Process

AN ELECTRODE which utilizes the "shielded arc" process to build up worn manganese steel castings has been developed by the Lincoln Electric Co., Cleveland, Ohio. The new electrode known as "Manganweld," not only simplifies welding procedure but also produces a weld with the structure and qualities of wear-resisting cast manganese steel, it is said.

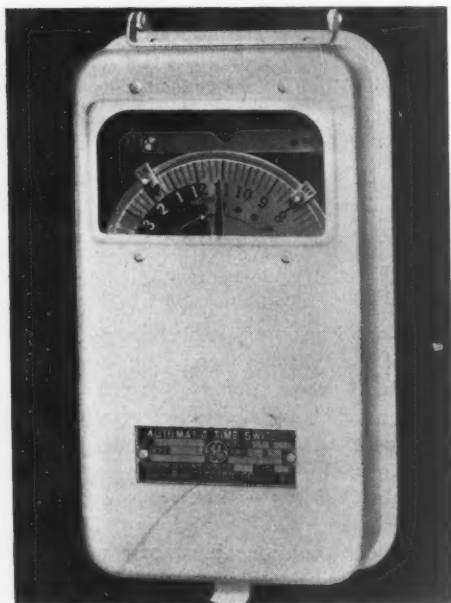
"Manganweld" electrodes are said to be 11 to 15% manganese steel and the weld is "air toughening," which is said to eliminate the necessity of quenching the bead.

The manufacturer claims that "Manganweld" as deposited has a Rockwell C hardness of 5 to 10; and after cold working, attains a Rockwell C hardness of 45 to 50. "Manganweld" electrodes are used with reversed polarity.

Manganweld is manufactured in $\frac{3}{8}$ -, $\frac{5}{32}$ -, $\frac{3}{16}$ -, and $\frac{1}{4}$ -in. sizes of the standard 14-in. lengths.

Time Switch

A NEW SWITCH, designated as G. E. Type T-13, a product of the General Electric Co., Schenectady, N. Y., will turn lights on and off at dusk and at dawn, or at any predetermined time, and will make due allowances for geographical latitude and for the season of the year. It can perform such operations as starting motors in the



Automatically starts machinery

morning, starting and stopping them throughout the day according to schedule and shutting them down at the end of the day.

The new switch can do two things at once. In an apartment house, for instance, it can turn on the hall and fire lights at dusk, turn off the hall lights at midnight, and keep the fire lights on until dawn.

Not all the above duties can be performed by the one switch, but various designs are available for such different tasks.

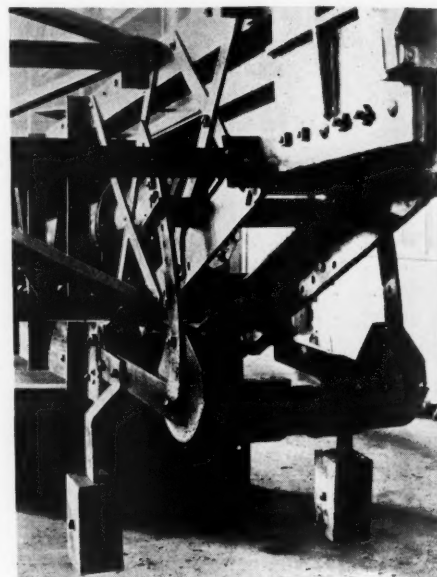
It is designed for alternating-current circuits of 115 volts and 30 amperes or 230 volts and 15 amperes current-carrying capacity.

Two adjustable riders give two operations every 24 hours. Except in the cases of the astronomic and two-circuit types, additional riders may be installed to give practically any number of operations daily; and the addition of an omitting device permits one or more days to be skipped if desired.

Announce Improvements on Screen Nozzle Ladder

TWO IMPROVEMENTS are announced by the Eagle Iron Works, Des Moines, Ia., on the Eagle "Swintex" screen nozzle ladder.

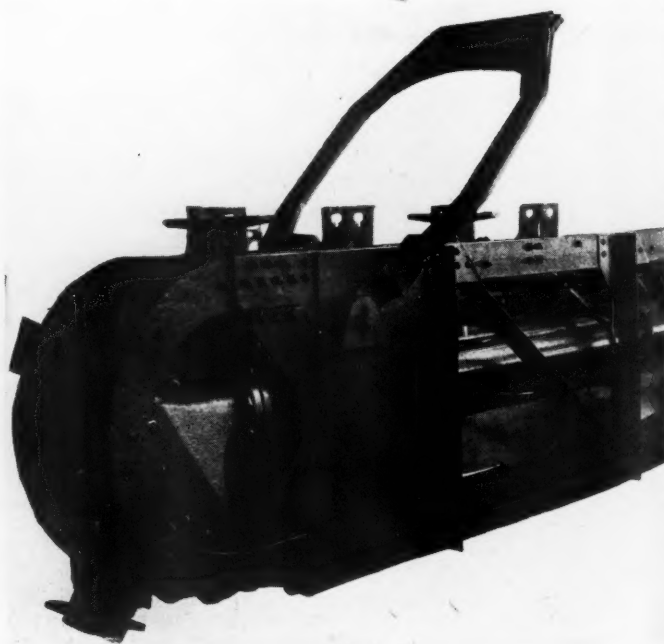
The first is a device to keep the chain tight around the nozzle end of the ladder. It is said in a few installations of this ladder undesirable **oversize** boulders were found slipping under the chain from the side when the ladder was in the steepest digging position. The automatic chain tightener now furnished on all ladders is said to keep the chain taut across the nozzle opening no matter what the digging angle. It consists of a cradle riding the chain at the slack point between the drive sprocket and the lower track, counterweighted so the steeper the angle of digging the longer the counterweight arm and the greater the force thrown



Automatic chain tightener

against the chain to keep the slack always at the same point.

The second improvement is the new type of hook link incorporated in the chain. A pair of straight hook links are placed every fourth pitch in the chain. These links contain a slotted horizontal hole in which a cross bar may be inserted. It is said lugs on the bar center it between the straight hook links and prevent it working sideways. With this arrangement there is only the one style of hook link on the chain and as many bars



Cross bar may be inserted in every fourth link

for agitation and clearance cutting may be used as are required to operate most efficiently.

New Type Mill

THE Fuller Lehigh Co., New York City, has developed a new pulverizer known as the Fuller Lehigh "Type C" pulverizer, for use in plants requiring relatively small amounts of pulverized coal.

The design of this mill is said to include the ball and grinding ring principle of pulverizing. The coal is pulverized by large-diameter balls grinding under pressure between upper and lower grinding rings. The pressure between the grinding parts is applied and maintained by a heavy steel spring mounted in the top section of the mill.

The manufacturer states the mill also is suited for pulverizing coals of different grindabilities, since the grinding pressure of the machine can be adjusted to suit the hardness of the coal.

It is claimed wet coal can be pulverized in the Type C pulverizer when preheated-air is used for separation of the fines. Since the coal is dried by the hot air as it flows through the mill, it is unnecessary to install separate drying equipment for this purpose.

Ship Large Aluminum Dragline Boom

THE Marion Steam Shovel Co., Marion, Ohio, has just shipped the McWilliams Dredging Co., Chicago, Ill., an aluminum alloy boom for use on one of its Marion Type 5241 dragline excavators in work on the Mississippi flood prevention project, the first ever built for a large dragline. Aluminum alloy, which weighs about one-third as much as steel, permits this boom to be built with a weight less than one-half that

of a steel boom of equivalent length and strength.

On certain of the Mississippi river work the question of the working weight of the excavator is of prime importance. For such work the excavator with an aluminum alloy boom is said to permit the excavator to be used where the floor or footing is so unstable as to preclude the use of a machine of all steel construction.

In other parts of the work the range or

ity and, the manufacturer states, without any increase in the gross power or labor expense.

The weight of the steel boom is such that for ease in handling, shipping and assembling in the field it must be made in three sections, while, it is said, the aluminum boom can be made in two.

Waterproof Sealing Compound

PIGMENTS of a lubricating nature are said to be used in the manufacture of "Hydro Seal," a new product announced by the Quigley Co., Inc., New York, N. Y., to seal thread, flange and gasket joints in lines carrying water, artificial and natural gas, air and low pressure steam.

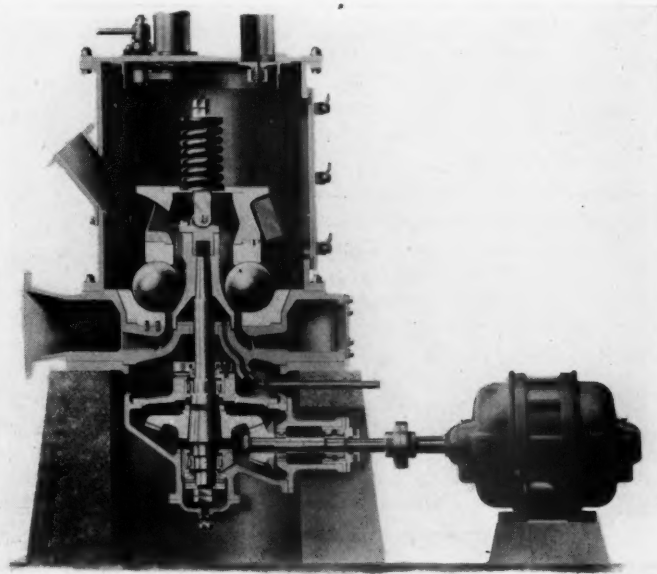
The manufacturer states this material remains plastic and is unaffected by vibration or contraction and expansion of metal. It is also said joints can be broken with ease, regardless of age or conditions to which they have been subjected.

The sealing compound is claimed to remain in equal suspension. In using, it is applied with an ordinary paint brush.

Announces 1-Yd. Convertible Shovel

THE NEW 32-B, 1-yd. convertible shovel-dragline-crane-clamshell, is announced by the Bucyrus-Erie Co., So. Milwaukee, Wis.

Choice of gasoline, diesel or electric power, and either rope or chain crowd on shovel are optional. Special mountings for soft ground dragline work are said to be provided. All continuously running shafts are mounted on ball bearings. It is said engine



Unit pulverizes fuel for small capacity plants

reach of the excavator is said to be the principal factor. Here the excavator with aluminum alloy boom can be built of a given working weight and bucket capacity, but with much greater range than with a boom of all steel construction.

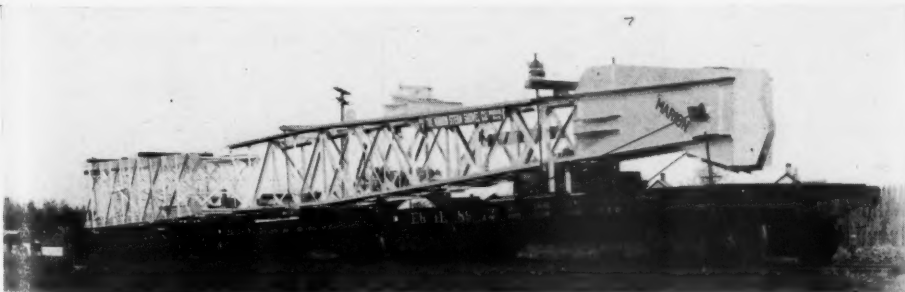
In still other portions of the work the yardage capacity of the excavator is of greater importance than either of the above. In this case the excavator with aluminum alloy boom can be built with the same working weight and range as one with the steel boom, but having much larger bucket capacity.



All continuously running shafts are in ball bearings

transmission gears are fully enclosed and run in oil as do also the boom-hoist worm and gear and the reversing transmission gears for swinging and propelling.

According to the manufacturer, the transmission gears are silent with generated teeth, machine-cut from solid steel. There is an outside band power-take-off clutch and positive power dipper trip. The machine has a box girder boom and outside handles, single-shaft drive caterpillar mounting and an inserted tooth dipper.



Aluminum alloy boom less than one-half the weight of steel

Stockpile Loader

A LOADER said to be designed especially for average stockpile loading requirements is announced by the George Haiss Manufacturing Co., New York, N. Y.

This model 50 is said to have a capacity of $1\frac{1}{2}$ to $1\frac{3}{4}$ cu. yd. per minute in handling materials in lumps not larger than 6-in. and weighing not more than 125 lb. per cu. ft.

It is driven by a 37-hp., 4-cylinder gasoline engine equipped with intake air cleaner, oil filter, gasoline strainer and inbuilt governor.



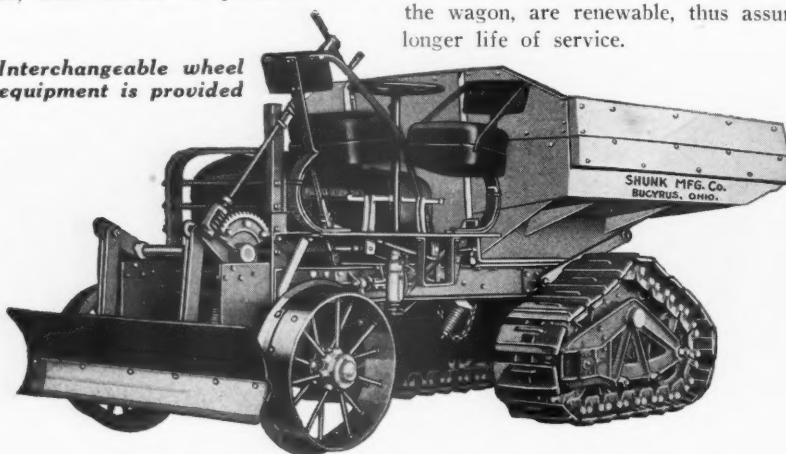
Buckets are tooth-edged

The manufacturer states this loader is equipped with enclosed roller and ball-bearing transmission. It is also said the feeding device consists of manganese steel feeding propellers. The buckets of the loader are tooth-edged, seamless forged, 12 by 18 in. The net weight is said to be 13,600 lb.

Improved Tractor Dump Wagon

A NNOUNCEMENT is made of a flexible front axle as standard construction on the "Camel," a tractor dump wagon produced by the Shunk Manufacturing Co., Bucyrus, Ohio. Interchangeable wheel equipment is provided, and the manufacturer says crawlers, steel wheels or pneumatic tires

Interchangeable wheel equipment is provided



Flexible front axle provides angularity for uneven work

may be mounted in the field. A hydraulic governor checks the gravity return of the body, in dumping, to minimize jar to the chassis. To provide sufficient angularity for uneven and rough excavation the flexible front axle was adopted. It is said to have an oscillating movement of 14 in. In the rock products industry this unit is suitable for handling stripping, rock, sand and gravel. It can also be used as a bulldozer.

Bottom-Dump Cart Type Crawler Wagon

THE TRACKSON CO., Milwaukee, Wis., announces a complete 7-yd. crawler wagon of the bottom-dump cart type suitable for heavy hauling about the quarry or sand and gravel pit. Some of the features claimed for this wagon are strong front and rear ends, improved tongue and drawbar connections, a body that sheds the material, a simple, easily operated door-winding device, greater clearance on the dump, light weight and high strength, renewable wearing parts, and serviceable crawler wheels.

One of the biggest advantages of this new dirt-moving unit is said to be the fact that all parts, both in the wheels and in the wagon, are renewable, thus assuring a longer life of service.



Crawler wagon is provided with renewable parts

Colloidal Graphite for High Temperature Lubrication

BY EMPLOYING a colloidalizing process graphite particles are said to be reduced in size to a point where they are visible only by reflection in the ultra-microscope.

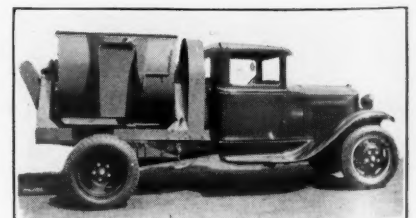
During the process which the Acheson Oildag Co., Port Huron, Mich., uses in making "Oildag" it is said the minute particles become charged equally and alike. These like charges are said to cause the particles to repel each other. This repulsion of the charged particles is said to permit substances in the colloidal state to remain indefinitely suspended in fluids even though the latter are of lower density or specific gravity than the suspended body. It is also said the particle size of the graphite in Oildag is so minute as to pass through the pores of ordinary filter paper.

According to the manufacturer, in cement plants and other locations of high temperatures and heavy loads, combined with excessive dust, these properties are especially valuable in providing proper lubrication of equipment. The Oildag is charged in the lubricating oil, in amount depending on the service. Another product of this manufacturer is "Aquadag," a colloidal suspension of Acheson graphite in distilled water. It is said to be adaptable wherever a dense,

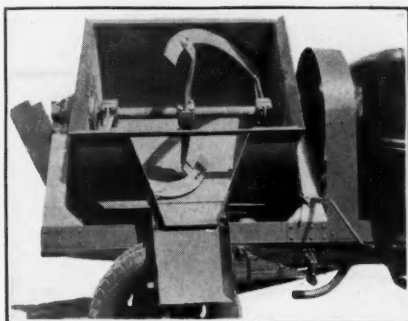
inert, opaque, insoluble, non-fusible solid is desired.

Concrete Truck Mixer

THE Concrete Transport Mixer Co., St. Louis, Mo., announces its concrete "Transport" mixer with capacities of 1 to



Mixer equipped with side or rear discharge



Spiral rotor is the mixing element

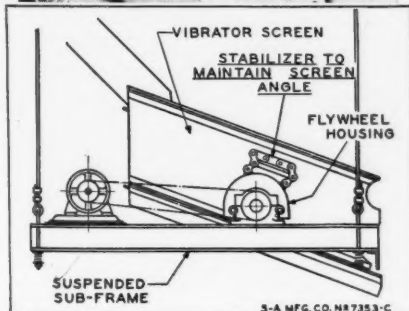
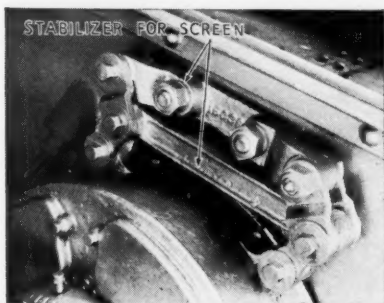
3½ cu. yd. One power unit operates both the mixer and truck. It mixes while traveling or stationary. The manufacturer says the spiral rotor accomplishes complete mixing and uniform agitation throughout the load. Main rotor bearings are Timken roller-bearing equipped. Rotor blades are of manganese steel. Concrete "Transport" mixers are equipped with side or rear discharge, as desired.

New Type Mounting for Vibrator Screens

A NEW TYPE vibrating screen mounting has been developed by Stephens-Adamson Manufacturing Co. of Aurora, Ill.

In the new mounting, balancing springs have been replaced by a single mechanical unit called a "stabilizer." This is mounted on one side of the screen and while the screen body can vibrate freely with the eccentric drive shaft, it is said it cannot be rocked or bounced by sudden surges of material over the screen.

The unit holds the screen at a definite screening angle yet, the manufacturer states, offers no resistance to the vibrating action. The screen body can be quickly shifted to



One mechanical unit replaces springs

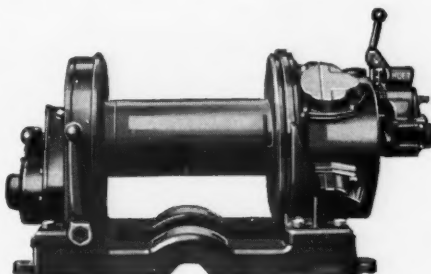
a new angle by simply loosening two bolts on one side of the screen.

The stabilizer consists of two pairs of short cast-steel arms, each jointed in the middle, and held parallel by a heavy cross bar. One end of each arm pivots on the flywheel housing, which is mounted on the steel subframe. The other end of each arm is free to move in a shackle on the screen body.

Arms are free to swing or bend in any direction, it is said, but both *must* act together. All arms and brackets are of cast steel and the hinge pins are equipped with Nathan automatic oil feeders, which force oil under constant pressure to the moving surfaces.

New Size Hoist Announced

THE INGERSOLL-RAND CO., New York, N. Y., has increased its line of "Utility" hoists through the addition of the size HUL. This unit is said to have a longer drum and a greater cable capacity than any previous member of the line. It



Longer drum increases cable capacity

provides for 2900 ft. of ¼-in. cable, 1400 ft. of ⅜-in. or 800 ft. of ½-in. Its rated working capacity at 80 lb. air pressure is 2000 lb. at a rope speed of 120 ft. per minute. The manufacturer claims this rating is conservative and can be exceeded with safety.

It is said this new hoist can be employed wherever a portable hoist is required. Among its applications are handling tools and supplies, moving cars and single-cable slushing work.

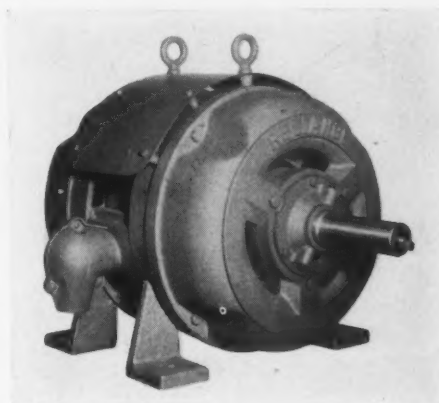
The air motor is a reversible, 4-cylinder, radial-piston type. Ball or roller bearings are used throughout.

A jaw-type clutch is provided for engaging or disengaging the motor with the drum. An external contracting type brake is used.

Drip Covers Protect Motors

RELIANCE ELECTRIC AND ENGINEERING CO., Cleveland, Ohio, has developed drip covers applicable to either its alternating or direct current motors.

The covers are used to protect the motors



Protection from dripping oil or water

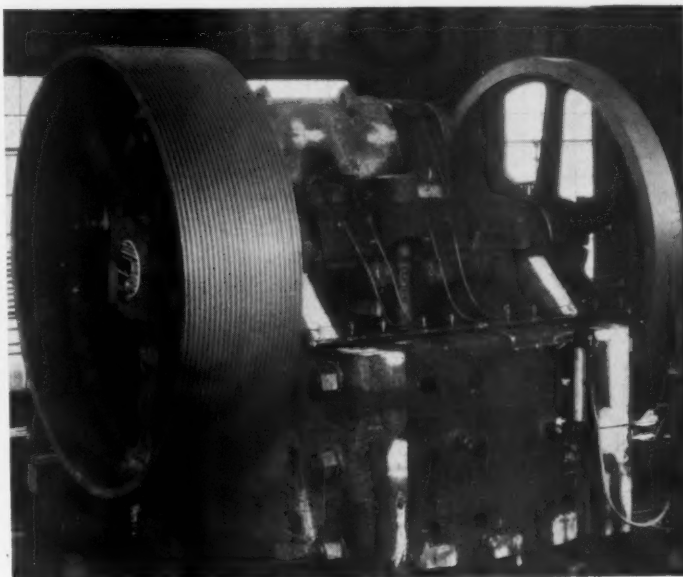
in bad locations from dripping water, acid or other injurious solutions.

The covers are made of heavy-gage sheet steel. They are securely bolted to the frames in roof-like fashion so that an opening is provided between motors and cover to permit free circulation.

Large Crushers Furnished Russia

A NNOUNCEMENT IS MADE by the Traylor Engineering and Manufacturing Co., Allentown, Penn., of a recent shipment of two Type G jaw crushers, each weighing nearly 500,000 lb., to the Soviet for a new blast furnace and steel plant in the Urals.

In addition, it is said, a 60-in. gyratory is now being built which will weigh close to a million pounds when completed.



This crusher weighs half a million pounds

Recent Prices Bid and Contracts Awarded

North Platte, Nebr. Contract for graveling, 2 in. thick, four miles of county road southwest of Sutherland was awarded to E. B. Yates for 77c. per cu. yd.

Kent, Wash.—S. R. Gray, Puyallup, was given the contract for the construction of 1½ miles of graveled highway on a bid of \$25,587.

Port Huron, Mich. Hersey Gravel Co. of Hersey was the lowest bidder on 5¼ miles of a 20-ft. concrete road in Bay county. Its bid was \$127,808.18.

Troy, Mo. Contract for the construction of 1.9 miles of gravel road in Boone county has been awarded to Ray and Son, Inc. The bid was \$926.

Appleton, Wis. Contract for furnishing approximately 3000 cu. yd. of crushed gravel for improvement of former state highway 54 was awarded to the Greunke Grading Co. on a bid of 79c. a cu. yd. delivered.

Watertown, S. D. The bid of a Hector, Minn., company on 31 miles of gravel road of \$11,217 is about one-third what the county has been paying for highway graveling. The contract was awarded.

Ames, Iowa. C. F. Lytle Construction Co. entered the low bid of \$1.57 per sq. yd. for 2.954 miles of concrete in Winnebago county. Gravel projects totaling 20.31 miles, totaled on a basis of low bids \$24,062.50.

South Bend, Wash. The Harbor Sand and Gravel Co. bid of \$5000 was accepted for surfacing and graveling 1.25 miles of road near here.

Lincoln, Nebr. Contract was awarded the Abel Construction Co. for graveling 7.2 miles of highway in Lancaster county for \$5270.

Fight Specifications Permitting Blacktop Pavement Only

ALBERT J. WEDEKING, chairman of the Indiana state highway commission, announced recently that action on several road projects on which bids had been received, would be held up pending an additional opinion from James M. Ogden, attorney general, as to the legality of bids. Submitted for three types of paving, each bid was for the blacktop type. The attorney-general has within the last ten days in an opinion to Governor Leslie stated that specifications for bids, including blacktop only and excluding concrete, brick and tarvia or either of these, are illegal.

In spite of the stand taken by the governor, attorney general and chairman of the state highway commission the city council of Jeffersonville follows the opinion of City Attorney Warder.

In the *Louisville Times* of recent date there is published "the first of a series" of articles after an investigation of the letting of contracts for asphalt used in the construction of streets, showing there is a difference

of \$1.61 in the cost to the property holder. We are wondering whether there is such a difference here.—*Jeffersonville (Ind.) News.*

Building Material Prices Decline in June

PRICES of feed, fuels and building materials at the close of June were still above pre-war levels, while other prices were at or below pre-war averages, according to a statement on "the price situation," issued July 15 by the Department of Agriculture.

Commodity prices at wholesale dropped nearly 2% in June, according to a statement issued July 18 by the Bureau of Labor Statistics, Department of Labor.

In the following table are shown the index numbers of wholesale prices of building materials (1926 equals 100.0). The purchasing power of the dollar is shown in column A:

| | June, 1930 | May, 1931 | June, 1931 | A |
|--------------------------------|------------|-----------|------------|-------|
| Building materials.... | 90.0 | 78.4 | 77.5 | 1.290 |
| Brick | 83.0 | 80.8 | 80.8 | 1.238 |
| Cement | 91.7 | 79.7 | 77.7 | 1.287 |
| Other building materials | 99.6 | 93.2 | 91.7 | 1.091 |

Estimating Strength of Worn Wire Ropes

THE NUMBER of broken wires per rope lay is the proper basis for estimating remaining strength, says an article, "Correctly Estimating Remaining Strength," in the June-July issue of *Wire Engineering*. The article then gives in detail information on this subject. Illustrations of important points are included.

A safety guide for economical wire rope service is then given. This article includes several charts to assist in this determination. Factors said to be instrumental in determining the safe life of wire rope are corrosion, broken wires, abrasion and internal wear. The charts and data presented should be valuable to those using wire rope on skip hoists and in other applications about rock products plants.

Ransome Acquires Transit Mixers

ANNOUNCEMENT is made that the Ransome Concrete Machinery Co., Dunellen, N. J., has acquired a controlling interest in Transit Mixers, Inc., and will hereafter manufacture at its plant in Dunellen for that concern its Transit mixers.

This does not mean, it is said, that there will be any change in the position or policy of the Ransome Concrete Machinery Co. in the field now occupied by it. The two companies will operate as distinctly separate units and there is no connection by the Ransome Concrete Machinery Co. by license agreement or otherwise with any other concern in the truck mixer field.

Conveyor and Elevator Belt Practice

A BOOKLET has recently been issued by the Diamond Rubber Co., Inc., Akron, Ohio.

It is said the notes in the booklet are not offered as a treatise on conveyor engineering, but touch only on such practical features of design and maintenance as have a bearing on the welfare and life of the belt itself.

The information is said to be based on an interchange of experience with those designers and operators of conveying and elevating machinery with whom the company has co-operated during the past 30 years, in an effort to perfect the belt in its construction and operation.

The suggestions offered should prove helpful, not only to the new conveyor owner, but also to the experienced belt user, who is studying every refinement in operating conditions to realize fractional reductions in costs.

Lubricating Materials

IN THE CURRENT ISSUE of *Lubrication* a method for the laboratory determination of lubricating ability of oil and grease is discussed. The conclusions drawn in this article are that the change which may occur in a lubricant during actual operation must be given due consideration in original selection.

It is impossible, of course, to simulate operating conditions absolutely in any laboratory determination of lubricating value. As a rule, these will vary over too wide a range. It is perfectly practicable, however, to carry on such work under standardized conditions of load, speed and temperature, varying any of these factors to conform to what might be considered abnormal operation.

The ultimate result, based on the methods as outlined heretofore, would, without a doubt, give a better understanding of the extent to which the characteristics of a lubricant might change, and the degree to which such possible changes might be anticipated in preparing original specifications when in the market for such products.

Another article in the issue discusses the effect of lubrication on the use of exhaust steam for process heating.

Prizes for Missing Links

THE Chain Belt Co., Milwaukee, Wis., is conducting a prize contest from August 2 to September 21 for the best articles and sketches covering installations of chain or belt conveyors to reduce costs in existing plants.

Cash prizes will be given for the 21 best articles submitted and all entries must be in by September 21.

The Rock Products Market

Wholesale Prices of Aggregates

(F.O.B. Plant or City Designated)

| | Crushed stone Screenings, ½ in. and less ¼ in. down to 2½ in. | Sand ¾ in. and less | Gravel, ½ in. and less to 2 in. | Slag Crushed, ½ in. and less to 3 in. |
|--|--|---------------------------|--|---|
| Prices given are for crushed limestone per ton, unless otherwise stated | | | | |
| EASTERN: | | | | |
| Albany, N. Y. | | .70 | 1.00 | |
| Bethlehem, Penn. | | | | .50-.60 |
| Birdsboro, Penn. (trap rock) | 2.10 | 2.20-2.50 | | .60-1.00 |
| Boston, Mass. (s) | | 1.15 | 1.75 | |
| Buffalo, N. Y. | | 1.00-1.10 | 1.00-1.10 | 1.50d 1.50-1.60d |
| Erie and Du Bois, Penn. | | | | 1.50 1.50-1.60 |
| Hillsville, Penn. | .85 | 1.35 | | |
| Hartford, Conn. (trap rock) | 1.70 | 1.70-1.95 | 1.40* | 1.50-1.70 |
| Montoursville, Penn. | | .60-1.00 | .40-.50 | |
| Oriskany Falls, N. Y. | .50-1.00 | .80-1.25 | | |
| Philadelphia, Penn. (a) (trap rock) | 3.45-5.70 | 3.45 | 1.40-1.50 | 1.95-2.20 |
| Pittsburgh, Penn. | | | 1.20 | 1.00c |
| Rochester, N. Y. | | | 1.40 | |
| Washington, D. C. | | .85 | 1.30 | |

| | | | | |
|---------------------|------|-----------|-----------|------------------|
| CENTRAL: | | | | |
| Alton, Ill. | 1.75 | 1.75 | | |
| Cape Girardeau, Mo. | .90 | 1.00-1.10 | | |
| Chicago, Ill. | | | .90 | .90-1.00 |
| Dubuque, Ia. | .90 | 1.00 | | |
| Eau Claire, Wis. | | | .40 | .50-.85 |
| Grand Rapids, Mich. | | | .40-.50 | .60-.70 |
| Greenbush, Mich. | | | .40 | .70w |
| Jackson, Ohio | | | .27-.54 | .45-.65 |
| Indianapolis, Ind. | | | .40-.60 | .50-.60 |
| Riverton, Ind. | | | | 1.05† 1.45-1.80† |
| Ironton, Ohio | | | | |
| Maplewood, Mo. (g) | 1.75 | 1.75 | | |
| Milwaukee, Wis. | 1.14 | 1.24 | 1.15-1.60 | 1.15-1.60 |
| Stone City, Ia. | .75 | .95-1.10p | | |
| St. Louis, Mo. | | .70 | 1.10-1.25 | |
| St. Paul, Minn. | .75 | 1.25 | .35 | 1.25 |
| Toledo, Ohio | 1.10 | 1.60 | | 1.00 1.10 |
| Waukesha, Wis. | | 1.90 | 1.45-1.60 | 1.60-1.65 |

| | | | | |
|-------------------------------|-----------|------------|-----------|------------------|
| SOUTHERN: | | | | |
| Ashland, Ky. | | | | 1.05† 1.45-1.65† |
| Birmingham, Ala. | | | | .55† .80-1.25 |
| Cartersville, Ga. | .85 | .85-.95 | | |
| Chico, Tex. | .50c | 1.20-1.30c | | |
| Columbia, S. C. (granite) | | 1.40-1.60p | | |
| Ensley and Alabama City, Ala. | | | | .55 .80-1.25 |
| Fort Spring, W. Va. | .25 | 1.00-1.35 | | |
| Houston, Tex. | | | 1.25* | 1.95v |
| Knippa, Tex. (trap) | 2.50c | 1.15-2.00c | | |
| Knoxville, Tenn. | .50 | .90-1.00 | .70-1.00 | 1.05-1.50c |
| Longdale, Va. | | | | .75 .95-1.25 |
| Montgomery, Ala. | | .25-.35 | .50-.60 | |
| New Orleans, La. (r) | | .80-1.20 | 1.10-1.55 | |
| Olive Hill, Ky. | .50 | .90-1.00 | | |
| Richmond, Va. (q) | | | 1.15-1.30 | 1.00-1.25 |
| San Antonio, Tex. | 1.50-1.75 | 1.50-1.75c | | |
| Tyrone, Ky. | .50-.90 | .50-1.25 | | |

| | | | | |
|-----------------------------------|------|------------|------------|------|
| WESTERN: | | | | |
| Denver, Colo. | | 1.15-1.25 | 1.25-2.05 | |
| Los Angeles, Calif. (t) (granite) | | 2.10 | 1.60 | 2.10 |
| Phoenix, Ariz. | | 1.65-1.75* | 1.50-2.00* | |
| Salt Lake City, Utah | | | .60 | .60 |
| San Francisco, Calif., Bay points | 1.45 | 1.45 | | |
| Seattle, Wash. | | 1.25* | 1.25* | |
| Spokane, Wash. | | 1.00-1.50* | 1.00* | |
| Tulsa, Okla. (u) | .70 | 1.20-1.60 | | |

*Prices per cu. yd. †Less 10c per ton monthly settlements disc. ‡Prices less 5c disc. per ton for payment 15th following month. (a) Consumer prices subject to cash disc. of 10c per ton. (b) ½ in. to 1½ in. (c) 1½ in. and less. (d) F.o.b. trucks at plant. (e) Asphalt filler dust in bulk 4.75, in 3-ply paper bags, 5.40. (f) Price per cu. yd. f.o.b. scows. (g) Delivered in truck loads. (h) F.o.b. cars Knoxville, including tariff for 15 mile R. R. haul. (i) Price f.o.b. cars. (j) Cash disc. 2%. (m) F.o.b. plant. (n) 5% cash disc. payment 10 days; 30 days net. (o) F.o.b. cars or truck at plant. (p) ¾ in. to 2½ in. (q) Prices per net ton f.o.b. bins. (r) Delivered. (s) Price f.o.b. cars; 1.50 per cu. yd. for city delivery on job. (t) F.o.b. job site via motor truck. (v) Less 10c cash disc. (w) 2-in. and less.

Whiting

| | |
|---|-------------|
| St. Louis, Mo., per ton | 15.00* |
| Chicago, Ill., prices per ton | |
| Domestic putty whiting | 10.00-12.00 |
| Domestic precipitated whiting | 15.00-20.00 |
| Imported bolted whiting | 30.00-35.00 |
| Philadelphia, Penn.—English chalk whiting packed in 50-lb. paper bags, per ton, in carloads | 15.00 |
| *Packed in bbl., f.o.b. St. Louis. | |

Fullers Earth

| | |
|--|-------|
| Prices per ton in carloads, f.o.b. Florida shipping points. Bags extra and returnable for full credit. | |
| 16-30 mesh | 20.00 |
| 30-60 mesh | 22.00 |
| 60-100 mesh | 18.00 |
| 100 mesh and finer | 9.00 |
| Joliet, Ill.—All passing 100 mesh, f.o.b. | |
| Joliet, incl. cost of bags | 24.00 |

Agricultural Limestone (Crushed)

| | |
|--|-----------|
| Alton, Ill.—90% thru 100 mesh | 4.50 |
| Cape Girardeau, Mo.—Analysis, CaCO ₃ , 94½%; MgCO ₃ , 3¼%; 90% thru 50 mesh | 1.50 |
| Cartersville, Ga.—50% thru 50 mesh, per ton, 1.25; pulverized limestone | 2.00 |
| Chico, Tex. (Lone Star Spur)—Agricultural limestone, ½-in. down, in carload lots, per ton, f.o.b. cars | 1.00 |
| Colton, Calif.—Analysis, 95.97% CaCO ₃ ; 1.31% MgCO ₃ all thru 14 mesh down to powder | 3.50 |
| Davenport, Iowa—Analysis, 92-98% CaCO ₃ ; 2% and less MgCO ₃ ; 100% thru 4 mesh, 50% thru 20 mesh; bulk. | 1.10 |
| Dolomite, Calif.—Analysis, 54% CaCO ₃ ; 45% MgCO ₃ ; 99% thru 10 mesh, per ton, 2.10; 49% thru 60 mesh, ¼-in. to dust, per ton | 1.70 |
| Gibsonburg, Ohio—Analysis, 55% CaCO ₃ ; 43.40% MgCO ₃ ; 50% thru 50 mesh, 1.25; pulverized, bulk, 3.00; in bags | 4.50 |
| Hillsville, Penn.—Analysis, 94% CaCO ₃ ; 1.40% MgCO ₃ , 75% thru 100 mesh; in bags, 5.00; pulverized | 3.00-4.50 |
| Knoxville, Tenn.—80% thru 100 mesh, bulk 2.00, in bags, per ton | 3.25 |
| Lannon, Wis.—90% thru 100 mesh, 50% thru 100 mesh | 1.50 |
| Middlebury, Vt.—Analysis, 99.05% CaCO ₃ ; 90% thru 50 mesh | 4.25 |
| Olive Hill, Ky.—90% thru 4 mesh, per ton | 1.00 |
| Osborne, Penn.—Analysis, 94.89% CaCO ₃ , 1.50% MgCO ₃ ; 100% thru 20 mesh; 60% thru 100 mesh and 45% thru 200 mesh, per ton, f.o.b. mine | 3.50 |
| Stone City, Ia.—Analysis, 98% CaCO ₃ ; 50% thru 50 mesh | .75 |
| Waukesha, Wis.—90% thru 100 mesh, 4.10; 50% thru 100 mesh, per ton | 2.10 |
| West Rutland, Vt.—Analysis, 96.5% CaCO ₃ ; 1% MgCO ₃ ; 90% thru 50 mesh; 60% thru 100 mesh, bags, per ton, 3.75; bulk | 2.50 |

Pulverized Limestone for Coal Operators

| | |
|---|------|
| Davenport, Ia.—Analysis, 92-98% CaCO ₃ ; 2% and less MgCO ₃ ; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton. | 6.00 |
| Waukesha, Wis.—90% thru 100 mesh | 4.10 |

Roofing Slag

Prices given are per ton f.o.b. city named, unless otherwise noted.

| | |
|-------------------------------|------------|
| Ashland, Ky. | 2.05* |
| Bethlehem, Penn. | 1.00-1.50† |
| Birmingham, Ala. | 2.05* |
| Ensley and Alabama City, Ala. | 2.05 |
| Ironton, Ohio | 2.05* |
| Jackson, Ohio | 2.05* |
| Longdale, Va. | 2.50 |
| Toledo, Ohio | 1.10 |

*Less 5c ton disc. for pay. 15th following month. †Price f.o.b. trucks at plant, subject to discount of 10c per ton for payment on or before the 15th of following month. ‡F.o.b. plant.

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

| | |
|--|-------|
| Martinsville, Va. | |
| Mine scrap, per ton | 16.00 |
| Franklin, N. C. | |
| Mine run, per ton, f.o.b. mine | 15.00 |
| Clean scrap for wet grinding, per ton, f.o.b. mine | 10.00 |
| Ground mica, per ton at mill, 20 mesh, 25.00; 40 mesh, 30.00; 60 mesh, 35.00; 100 mesh | 50.00 |
| Roofing mica, per ton at mill, schist, 17.00; white | 30.00 |
| Punch, per lb. | .05 |

Portland Cement

| F.o.b. city named | Per Bag | High Early Strength |
|----------------------------|------------|------------------------|
| Atlanta, Ga. | †1.87 | 2.92† |
| Birmingham, Ala. | †1.56 | 2.61† |
| Charleston, S. C. | 1.89† | 2.94† |
| Chicago, Ill. | 1.35† | 2.11† |
| Cincinnati, Ohio | 1.38† | 2.16† |
| Cleveland, Ohio .... | ..... | 2.34† |
| Columbus, Ohio .... | ..... | 2.26† |
| Dayton, Ohio .... | ..... | 2.19† |
| Detroit, Mich. .... | ..... | 2.30† |
| Jackson, Miss. | †1.94 | 2.99† |
| Jacksonville, Fla. | †1.96 | 3.01† |
| Indianapolis, Ind. | 1.39† | 2.04† |
| Louisville, Ky. | 1.41† | 2.09† |
| Memphis, Tenn. | †1.73 | 2.78† |
| Milwaukee, Wis. | 1.45† | 2.20† |
| New Orleans, La. | 1.86† | 2.96† |
| Portland, Ore. | ‡2.30-2.40 | ..... |
| Reno, Nev. | 2.76† | ..... |
| St. Louis, Mo. | 1.20† | 2.09† |
| San Francisco, Calif. | 2.04† | ..... |
| Savannah, Ga. | 1.89† | 2.94† |
| Seattle, Wash. | 2.20-2.45 | 2.75c |
| Tampa, Fla. | 2.00† | 3.16† |
| Toledo, Ohio .... | ..... | 2.28† |

Mill prices f.o.b. in carload lots, without bags, to contractors.

| | |
|--------------------------|-------|
| Davenport, Calif. | 2.25 |
| Lime & Oswego, Ore. | 2.40 |
| Limedale, Ind. | 1.10† |

NOTE: Unless otherwise noted, prices quoted are net prices, without charge for bags. Add 40c per bbl. for bags. *Includes dealer and cash discounts. †Includes 10c cash discount. ‡Subject to 2% discount payment 10th of month following invoice date. †"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c discount 15 days. (c) Quick-hardening "Velo," packed in paper bags, 10c discount 10 days.

Glass Sand

| | |
|--|------|
| (Silica sand is quoted washed, dried and screened) | |
| Klondike, Mo. | 2.00 |
| Millville, N. J. | 2.03 |
| Ohlton, Ohio | 2.35 |

Miscellaneous Sands

| City or shipping point | Roofing sand | Traction |
|------------------------|--------------|----------|
| Eau Claire, Wis. .... | ..... | .50-.75 |
| Ohlton, Ohio | 1.50 | 1.40 |

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; lowest net prices per ton f.o.b. plant

| City or shipping point | Fine | Coarse | Brass | Core | Furnace Sand | Stone |
|----------------------------|--|--------|-------|-------|--------------|-------|
| Albany, N. Y. | 2.00 | 2.00 | 2.00 | ..... | ..... | ..... |
| Columbus, Ohio | 1.50 | 1.50 | ..... | ..... | 3.50 | ..... |
| Eau Claire, Wis. .... | ..... | ..... | ..... | ..... | 2.00b | ..... |
| Elco, Ill. | Amor. silica, 90-99½% thru 325 mesh, \$10.00 | ..... | ..... | ..... | ..... | ..... |
| Montoursville, Penn. .... | ..... | ..... | 1.35a | ..... | ..... | ..... |
| New Lexington, Ohio | 2.00 | 1.25 | ..... | ..... | ..... | ..... |
| Ohlton, Ohio | 1.50 | 1.50 | ..... | 1.50 | 1.50 | ..... |
| South Vineland, N. J. | Washed silica, 1.50 per ton; dry white, 2.00 per ton | ..... | ..... | ..... | ..... | ..... |

*Damp. (a) To 1.60. (b) To 2.50.

Wholesale Prices of Slate

Lowest prices f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200 mesh, 6.00 per ton in paper bags

Roofing Slate

| City or shipping point | Prices per square—Standard thickness | 3/16-in. | ¼-in. | ⅜-in. | ½-in. | ¾-in. | 1-in. |
|--|--------------------------------------|----------|-------|-------|-------|-------|-------|
| Bangor, Penn.— | | | | | | | |
| Gen. Bangor No. 1 clear..... | 10.00 | 20.00 | 25.00 | 29.00 | 40.00 | 50.00 | |
| Gen. Bangor No. 1 ribbon..... | 9.00 | 16.00 | 20.00 | 25.00 | 35.00 | 46.00 | |
| No. 1 Albion..... | 7.25 | 16.00 | 23.00 | 27.00 | 37.00 | 46.00 | |
| Gen. Bangor No. 2 ribbon..... | 6.75 | ..... | ..... | ..... | ..... | ..... |  |
| Chapman Quarries, Penn.— | | | | | | | |
| No. 1 slate..... | 12.50 | 18.00 | 21.50 | 25.00 | 30.00 | | |
| Hard vein..... | 9.00-11.00 | 15.00 | 22.00 | 26.50 | 32.00 | 37.00 | |
| No. 2 slate..... | 8.00-9.00 | ..... | ..... | ..... | ..... | ..... |  |
| Pen Argyl, Penn.— | | | | | | | |
| Graduated slate..... | 16.00 | 23.00 | 27.00 | 37.00 | 46.00 | | |
| Albion blue-grey roofing slate, No. 1 clear 7.25; mediums 8.00; No. 1 ribbon 8.00. | | | | | | | |

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.

(b) Prices other than 3/16-in. thickness include nail holes.

(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to \$1.25 per square.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

| City or shipping point | Terrazzo | Stucco-chips |
|---|---------------|---------------|
| Brandon, Vt.—English pink, cream and coral pink..... | ‡12.50-‡14.50 | ‡12.50-‡14.50 |
| Cardiff, Md.—Crushed green marble..... | 12.50-14.50 | 12.50-14.50 |
| Crown Point, N. Y.—Mica Spar..... | ..... | ‡9.00a-‡12.00 |
| Davenport, Ia.—White limestone, in bags, ton..... | ‡6.00 | ‡6.00 |
| Los Angeles, Calif.—(a) White..... | ‡11.00-‡13.50 | ‡11.00-‡13.50 |
| Snowflake..... | ..... | ‡11.00-‡13.50 |
| Golden, browns, grey, blues, blacks..... | ‡16.00-‡18.50 | ‡16.00-‡18.50 |
| Dolomite, Calif. (Lone Pine)—(a) White..... | ‡8.80-‡8.80 | ‡8.80-‡8.80 |
| Snowflake..... | ..... | ‡8.80-‡8.80 |
| Golden, browns, grey, blues, blacks..... | ‡13.80-‡13.80 | ‡13.80-‡13.80 |
| Middlebrook, Mo.—Red..... | 20.00-25.00 | ..... |
| Middlebury, Vt.—White..... | ..... | ‡9.00-‡10.00 |
| Randville, Mich.—Crystallite, crushed white marble, bulk..... | 4.50 | 4.50-5.00 |
| Tuckahoe, N. Y. | 6.00 | ..... |
| Warren, N. H. .... | ..... | ‡7.00-‡11.25 |
| †C.L. ‡L.C.L. *Per 100-lb. (a) Including bags. | | |

Art and Cast Stone Aggregates

| | |
|---|---------------|
| Cardiff, Md.—Green marble fines in carloads; bulk, 7.50; in bags..... | 10.00 |
| Los Angeles, Calif.—Dolomite aggregates, all sizes and colors..... | ‡10.00-‡12.50 |
| Dolomite special cast stone, wet-cast aggregate, white, ¼-in. to dust a5.30 | ..... |
| †100-lb. sacks. ‡C.L. ‡L.C.L. (a) In open cars. | |

Chicken Grits

| | |
|--|-----------|
| Chico, Tex.—(Limestone) packed in 100-lb. sacks, per cwt., f.o.b. cars at plant..... | 1.00 |
| Davenport, Iowa—High calcium carbonate limestone, in bags, L.C.L., per ton..... | 6.00 |
| Gibsonburg, Ohio—(Agstone)..... | 10.00 |
| Los Angeles, Calif.—(Gypsum), per ton, including sacks..... | 7.50-9.50 |
| Maplewood, Mo.—(Limestone), per ton..... | 12.00 |
| Middlebury, Vt.—Per ton (a)..... | 10.00 |
| Port Clinton, Ohio—(Gypsum), per ton..... | 6.00 |
| Randville, Mich.—(Marble), per ton, bulk..... | 6.00 |
| Saltville, Va.—(Gypsum) in 100-lb. jute sacks, per ton..... | 12.00 |
| Waukesha, Wis.—(Limestone), per ton (a) f.o.b. Middlebury, Vt. ‡C.L. ‡L.C.L. | 8.00 |

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Masonry Cement

The prices shown here are for various brands of masonry and mortar cement, including cost of bags.

| | Per bag | Per bbl. |
|---------------------------|---------|-------------|
| Atlanta, Ga. | .42½ | 1.69-2.24* |
| Baltimore, Md. | .40¾ | 1.63-2.21* |
| Birmingham, Ala. | .42¾ | 1.69-2.21* |
| Boston, Mass. .... | ..... | 2.25* |
| Buffalo, N. Y. | .42¾ | 1.69-2.39* |
| Charleston, S. C. | .42¾ | ‡1.84-2.09* |
| Chicago, Ill. | ‡.46 | ..... |
| Cincinnati, Ohio | ‡.38½ | ‡1.54 |
| Cleveland, Ohio | ‡.46¾ | ‡1.87-2.12* |
| Columbus, Ohio | ‡.40¾ | ‡1.61 |
| Dallas, Tex. .... | ..... | 2.69* |
| Dayton, Ohio | ‡.39 | ‡1.56 |
| Des Moines, Ia. .... | ..... | 2.34* |
| Detroit, Mich. | ‡.41¾ | ‡1.67 |
| Indianapolis, Ind. | ‡.37½ | ‡1.50 |
| Jackson, Miss. .... | ..... | 2.31* |
| Jersey City, N. J. | .42¾ | 1.69-2.20* |
| Kansas City, Mo. .... | ..... | 2.39* |
| Louisville, Ky. | ‡.35½ | ‡1.42 |
| Memphis, Tenn. | ‡.43½ | ‡1.74 |
| Milwaukee, Wis. .... | ..... | 2.12* |
| New Orleans, La. .... | ..... | 2.43* |
| New York, N. Y. | .42¾ | 1.69-2.20* |
| Norfolk, Va. | ‡.49½ | ‡1.98 |
| Philadelphia, Penn. | .41¾ | 1.65-2.21* |
| Pittsburgh, Penn. | .42¾ | 1.69-2.10* |
| Richmond, Va. | .41¾ | 1.65-2.37* |
| St. Louis, Mo. | ‡.40¾ | ‡1.63 |
| Toledo, Ohio | ‡.41 | ‡1.64 |
| Tulsa, Okla. .... | ..... | 2.61* |
| Wheeling, W. Va. | .42¾ | 1.69-2.09* |
| Winston-Salem, N. C. | ‡.46¾ | ‡1.86 |

*Price for delivery in car lots to contractors at point given, including value of cloth sacks, for which refund is made of 10c each when returned in good order. Shipped in paper bags 25c a bbl. less. Price subject to cash discount of 10c bbl. for payment 15 days from date of invoice.

†Packed in paper sacks; price includes cost of sacks, and is subject to 10c bbl. discount for payment in 15 days.

Rock Phosphate

Prices given are per ton (2240 lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

| | |
|--------------------------|-----------|
| Gordonsburg, Tenn. | 4.25-4.75 |
| Mt. Pleasant, Tenn. .... | ..... |
| B.P.L. 76% | 6.25 |

Ground Rock (2000 lb.)

| | |
|--|-----------|
| Gordonsburg, Tenn. | 5.25-6.00 |
| Mt. Pleasant, Tenn.—(Lime phosphate) —B.P.L. 75%; per ton, bags extra..... | 12.80 |

Florida Phosphate (Raw Land Pebble)

| | |
|--|------|
| Mulberry, Fla.—Gross ton, f.o.b. mines | |
| 68/66% B.P.L. | 3.15 |
| 70% minimum B.P.L. | 3.75 |
| 72% minimum B.P.L. | 4.25 |
| 75/74% B.P.L. | 5.25 |
| 77/76% B.P.L. | 6.25 |

Lime Products

(Lowest carload prices per ton f.o.b. shipping point unless otherwise noted)

| | Finish- ing hy- drate | Ma- son's hy- drate | Agricul- tural hy- drate | Chem- ical hy- drate | Ground burnt lime, Bulk | Lump lime In bags | In bulk | In bbl. |
|--|-----------------------------|---------------------------|--------------------------------|----------------------------|-------------------------------|----------------------|---------|---------|
| EASTERN: | | | | | | | | |
| Buffalo, N. Y. | 5.50 | 5.50 | 11.00 | ..... | 6.00 | 8.00 | 6.00 | ..... |
| Cedar Hollow, De- vauld, Rambo and Swedeland, Penn. | 8.50c | 8.50c | 8.50c | 7.00 | 8.50 | 8.50 | ..... | ..... |
| Lime Ridge, Penn. .... | ..... | 8.00 | ..... | 6.00 | 7.00 | 4.50 | ..... | ..... |
| CENTRAL: | | | | | | | | |
| Cold Springs, Ohio..... | 5.50 | 5.50 | ..... | ..... | ..... | 6.00 | ..... | ..... |
| White Rock, Gibson- burg, Marblehead, Ohio, and Hunting- ton, Ind. | 7.00* | 5.50 | 5.50 | 11.00 | 6.00 | 8.00 | 6.00 | ..... |
| Delaware, Ohio | 7.00 | 5.50 | 5.50 | 6.50 | ..... | ..... | 5.00 | ..... |
| Tiffin, Ohio .... | ..... | ..... | ..... | ..... | 6.00 | 8.00 | ..... | ..... |
| SOUTHERN: | | | | | | | | |
| Cartersville, Ga. | 8.00 | 8.00 | ..... | ..... | ..... | ..... | 13.50 | ..... |
| Keystone, Ala. | 13.00 | 8.00 | 8.00 | 7.50 | 6.50 | ..... | 12.50 | ..... |
| Knoxville, Tenn. | 8.00 | 8.00 | 7.50 | ..... | ..... | 6.50 | 13.75 | ..... |
| Eagle Mountain, Va. | 8.00 | 8.00 | 8.00 | 6.50 | 6.50 | 8.00 | 6.50 | ..... |
| WESTERN: | | | | | | | | |
| Little Rock, Ark. | 12.40 | ..... | 12.40 | ..... | ..... | 9.90 | 17.40 | ..... |
| San Francisco, Cal. (b) 20.00 | 20.00 | 12.00 | 20.00 | ..... | ..... | ..... | ..... | ..... |
| San Francisco, Calif. (a) 19.00 | 15.00 | 12.50 | 14.00 | 11.00 | 17.60† | 11.00 | 17.60‡ | ..... |

(a) In 100-lb. bags. (b) Woodburnt lime: finishing hydrate, 20.00 per ton; pulv. lime, 2.00 per iron drum. Oil-burnt pulv. lime, 13.00-14.50 per ton. (c) In 50-lb. paper. (d) To 10.00. *At White Rock and Gibsonburg, Ohio. †In 200-lb. steel barrels. ‡Refund for return of barrels. †Refund for return of burlap bags. \$To dealers and industrial concerns in carload lots.

Cement Building Tile

| | | |
|-----------------------------------|--------|-------|
| Lexington, Ky.: | | |
| 5x12, per 1000..... | | 55.00 |
| 4x5x12, per 1000..... | | 35.00 |
| New Castle, Penn.: | | |
| Red, 9x15 in., per sq..... | | 12.00 |
| Green, 9x15 in., per sq..... | | 15.00 |
| Wichita, Kan. (Uncolite Tile) | | |
| Plain | Glazed | |
| 4x8x16-in., each..... | 0.08½ | 0.13 |
| 8x8x16-in., each..... | .10 | .15 |
| 8x8x16-in. (rock face), each..... | .11 | .16 |
| (Duntile) | | |
| 8x8x12-in., each..... | .10 | .14 |
| 6x8x12-in., each..... | .09 | .13 |
| 6x6x12-in., each..... | .08½ | .12 |
| 4x5x12-in., each..... | .05 | .08 |
| 4x4x12-in., each..... | .04½ | .07½ |

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

| | | |
|---|-------------|--|
| Cicero, Ill.—French and Spanish tile, | | |
| 9x15-in., per sq..... | 9.50–12.00 | |
| Closed end shingle, 8½x12½ in., per sq..... | 11.00–13.00 | |
| New York City, N. Y., per sq..... | 9.00 | |

Cement Drain Tile

Grand Rapids and Saginaw, Mich.—Price per 1000 ft. in carload lots.

| | | | |
|------------|--------|------------|--------|
| 4-in..... | 42.00 | 15-in..... | 341.25 |
| 5-in..... | 52.50 | 18-in..... | 472.50 |
| 6-in..... | 78.75 | 20-in..... | 630.00 |
| 8-in..... | 115.50 | 22-in..... | 787.50 |
| 10-in..... | 173.25 | 24-in..... | 892.50 |
| 12-in..... | 199.50 | | |

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

| | | | | |
|----------------------------------|--|--|-----------|--------|
| Brookville, Penn.*: 8x8x16..... | | | 18.00 | 23.00a |
| 8x10x16..... | | | 25.00 | 28.00a |
| Camden, N. J.: 8x8x16, each..... | | | | .17b |
| Lexington, Ky.: | | | | |
| 8x8x16..... | | | \$118.00* | |
| 8x8x16..... | | | \$116.00* | |
| Omaha, Neb. (Prices f.o.b. yard) | | | | |
| 8x 8x16, each..... | | | 0.09 | |
| 8x12x16, each..... | | | .11½ | |
| 8x 4x16, each..... | | | .06 | |
| 8x 3x16, each..... | | | .06 | |
| 8x 6x16, each..... | | | .08 | |

*Price per 100 at plant.

†Rock or panel face.

‡Face. \$Plain. (a) Rock face. (b) Less 10%.

Concrete Brick

Prices given per 1000 brick, f.o.b. plant.

| | Common | Face |
|----------------------------|--------|-------------|
| Birmingham, Ala..... | 13.00 | |
| Milwaukee, Wis..... | 14.00 | 15.00–42.00 |
| Prairie du Chien, Wis..... | 12.00 | 20.00–22.50 |
| Rapid City, S. D..... | 16.00 | 30.00 |

Potash Feldspar

Erwin, Tenn.—White; analysis, K₂O, 10.50%; Na₂O, 2.75%; SiO₂, 68.50%; Fe₂O₃, 0.06%; Al₂O₃, 17.75%; pulverized, 98% thru 200 mesh, per ton, bulk, 14.00; in bags..... 15.20

Keystone, S. D.—White; analysis, K₂O, 12.50%; Na₂O, 2.25%; SiO₂, 64.50%; Fe₂O₃, 0.03%; Al₂O₃, 19.50%; pulverized, 98% thru 200 mesh; bulk..... 14.00–16.50

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K₂O, 11.30%; Na₂O, 2%; SiO₂, 67%; Fe₂O₃, 0.10%; Al₂O₃, 18.60%; per ton, in bulk..... 15.00

Topsham, Me.—White; analysis, K₂O, 9.00%; Na₂O, 3.00%; SiO₂, 71.50%; Fe₂O₃, 0.09%; Al₂O₃, 17.00%; pulverized, 98% thru 200 mesh; per ton in bulk, 17.50; in bags..... 18.70

West Paris, Me.—(Chemically controlled.) Color, white; 200 mesh; analysis, K₂O, 11.20%; Na₂O, 3.20%; SiO₂, 65.70%; Fe₂O₃, 0.09%; Al₂O₃, 19.20%; per ton, in bulk..... 19.00

Soda Feldspar

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K₂O, 5.50%; Na₂O, 5.50%; SiO₂, 68.80%; Fe₂O₃, 0.10%; Al₂O₃, 18.60%; per ton, in bulk..... 18.00

Stone-Tile Hollow Brick

Prices are net per thousand, f.o.b. plant.

| | No. 4 | No. 6 | No. 8 |
|-------------------------|-------|-------|-------|
| Albany, N. Y.*†..... | 40.00 | 60.00 | 70.00 |
| Altadena, Calif..... | 45.00 | 55.00 | 65.00 |
| Asheville, N. C..... | 30.00 | 40.00 | 50.00 |
| Atlanta, Ga..... | 29.00 | 42.50 | 53.00 |
| Auburn, Wash..... | | 50.00 | 65.00 |
| Brownsville, Tex..... | | 53.00 | 62.50 |
| Brunswick, Me..... | 29.50 | 42.25 | 55.00 |
| Chula Vista, Calif..... | 32.50 | 42.50 | 50.00 |
| Daytona Beach, Fla..... | 45.00 | 55.00 | 65.00 |
| Frostproof, Fla..... | 45.00 | 65.00 | 75.00 |
| Houston, Tex..... | 36.00 | 53.00 | 66.00 |
| Klamath Falls, Ore..... | 50.00 | 60.00 | 70.00 |
| Longview, Wash..... | | 50.00 | 60.00 |
| Los Angeles, Calif..... | 29.00 | 39.00 | 45.00 |
| Macon, Ga..... | 25.00 | 35.00 | 45.00 |
| Mattituck, N. Y..... | 45.00 | 55.00 | 65.00 |
| Medford, Ore..... | 50.00 | 55.00 | 70.00 |
| Memphis, Tenn..... | 45.00 | 50.00 | 60.00 |
| Mincola, N. Y..... | 40.00 | 50.00 | 60.00 |
| Nashville, Tenn.*..... | 32.00 | 50.00 | 60.00 |
| New Orleans, La..... | 45.00 | 55.00 | 65.00 |
| Norfolk, Va..... | 33.00 | 46.00 | 60.00 |
| Passaic, N. J..... | 40.00 | 52.50 | 70.00 |
| Pawtucket, R. I..... | 27.50 | 41.25 | 55.00 |
| Presidio, Tex..... | 55.00 | 65.00 | 75.00 |
| Roanoke, Va..... | 32.50 | 40.00 | 50.00 |
| Salem, Mass..... | 40.00 | 60.00 | 75.00 |
| San Antonio, Tex..... | 37.00 | 46.00 | 60.00 |
| San Diego, Calif..... | 35.00 | 44.00 | 52.50 |
| Spartanburg, S. C..... | 32.50 | 40.00 | 52.50 |

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% discount.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chester, Vt.—Finely ground talc (carloads), Grade A—99.99¾% thru 200 mesh, 8.00–8.50; Grade B, 97.98% thru 200 mesh..... 7.00–7.50
1.00 per ton extra for 50-lb. paper bags; 166½-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of burlap bags. Terms 1%, 10 days.

Emeryville, N. Y.:
Ground talc (200 mesh), bags..... 13.75
Ground talc (325 mesh), in bags..... 14.75

Henry, Va.:
Crude (mine run), bulk..... 3.50
Ground talc (150–200 mesh), in bags..... 6.00–11.25

Canada Cement Outlook Good

AS THE Canada Cement Co., Montreal, Canada, swings into its busy season of the year, indications point to a good volume of business for 1931. Large power projects now under way, including the Beauharnois development, Chats Fall power project and the Abitibi Power and Paper development at Abitibi canyon, as well as other large projects, require important amounts of cement. Also, a number of Canadian cities have placed orders with the company this year for cement required on civic projects.

In view of the decline in general construction, small orders and retail business may not reach a large total this year, however.

Canada Cement has been affected only to a limited extent by the price cutting in the United States. The company does not suffer much from competition with imported products, because of the heavy expense in shipping cement any distance. Only at certain centers near the border has it been necessary to meet the low prices quoted by United States companies.

The company through various plant changes has improved its efficiency in recent years. This year, the Port Colborne plant is being converted to the wet process from the dry process, the last of the company's plants to be changed over to the cheaper and more efficient system of manufacture. The capacity of the Montreal East plant was increased to 15,000 bbl. daily from 10,000 by the change.—New York (N. Y.) Wall St. Journal.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

| | 4-in. | 6-in. | 8-in. | 10-in. | 12-in. | 15-in. | 18-in. | 20-in. | 22-in. | 24-in. | 27-in. | 30-in. | 36-in. | 42-in. | 48-in. | 54-in. | 60-in. |
|-------------------------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Grand Rapids, Mich. | | | | | | | | | | | | | | | | | |
| Sewer (c)..... | | .09 | .14 | .21 | .27 | .36 | .65 | .78 | 1.04 | 1.17 | 1.45 | 2.16 | | | | | |
| Culvert (d)..... | | | | .57 | .67 | .93 | 1.20 | 1.45e | | 1.80 | 2.10 | 2.45 | 3.30 | 4.00 | 5.10 | 6.00 | 7.45 |
| Tiskilwa, Ill. (a)..... | | | | .75 | .85 | .95 | 1.20 | 1.60 | | 2.00 | | 2.75 | 3.40 | | 6.50 | | 10.00 |
| Wahoo, Neb. (b)..... | | | | | .85½ | | 1.14 | | | 1.81 | | 2.47 | 3.42 | 4.13 | 5.63 | 6.49 | 7.31 |

(a) Reinforced. (b) Reinforced, 15.40 per ton, f.o.b. plant. (c) To dealers. (d) To contractors. (e) 21-in. pipe.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

| City or shipping point | Crushed Rock | Ground Gypsum | Agri-cultural Gypsum | Stucco Calcinced Gypsum | Cement and Gaging Plaster | Wood Fiber | Gaging White | Plaster Sanded | Cement Keene's | Finish Trowel | Wallboard | | |
|------------------------------|--------------|---------------|----------------------|-------------------------|---------------------------|------------|--------------|----------------|----------------|---------------|--|--|--|
| | | | | | | | | | | | Plaster Board— ¾x32x 36". Per M Sq. Ft. | Plaster Board— ¾x32x 36". Per M Sq. Ft. | Wallboard, ¾x32 or 48" Lengths Per 6'-10". Per M Sq. Ft. |
| Los Angeles, Calif. (a)..... | 4.90 | | 7.90–8.90 | 12.20e | 13.20l | | 13.20l | | 38.00 | | 21.12 | 23.34 | |
| Medicine Lodge, Kan..... | 1.45 | | | | | | 11.50b | | 16.00b | | | | |
| Port Clinton, Ohio..... | 4.00 | 6.00–8.00 | 6.00–8.00 | 10.00m | 10.00n | 10.00n | 20.00k | 8.00–11.00 | 24.50f | 26.00g | 15.00h | 15.00h | 27.00j |
| Oakfield, N. Y..... | 2.50 | | | 7.00b | 9.00b | 9.00b | | 6.00b | | | | | |
| Victor, N. Y..... | 1.85 | | | | | | | | | | | | |
| Winnipeg, Man..... | 5.00 | 5.00 | 7.00 | 13.00 | 14.00 | 14.00 | | | | | 20.00 | 25.00c | 33.00d |

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) Plaster board, ¾x16x48-in., weight 1850 lb., 16c a yd. (b) Includes paper bags. (c) Includes jute sacks. (d) "Gyproc," ¾x48-in. by 5 and 10 ft. long. (e) To 13.20. (f) To 27.50. (g) To 29.00. (h) To 16.00. (j) To 28.00. (k) To 23.00. (l) To 14.20. (m) To 12.00. (n) To 13.00.

News of All the Industry

Incorporations

Welch-Sandler Sand Co. (Missouri), incorporated in Kansas, \$31,000.

Perry Lime Rock Co., Perry, Ga., \$25,000. J. Meade Tolleson of Houston County, Ga.

Matgo Gravel Co., Brentwood, N. Y., 200 shares common.

Bristol Granite and Marble Works, Inc., Bristol, Va., \$550,000. John M. Shireffs, Bristol, Tenn.

Western Stucco Co., Ltd., Vancouver, B. C., Can., \$75,000.

Perfecto King Products Co., Ltd., Wilmington, Del., \$100,000. To produce limestone, graphite, etc.

Tri-State Marble Tile Co., Inc., Shreveport, La., \$10,000.

United States Fluorspar Corp., incorporated in Delaware, \$5,000,000, 100,000 shares of no par value.

Charlotte Marble and Granite Co., Charlotte, N. C., 400 shares of no par value. Frank Sims, Marion Sims and Grainger Pierce.

Travertine Quarries, Inc., Sarasota, Fla., 250 shares, par value \$100 each. A. W. Naupold, L. J. Larson and E. F. Staples.

Custer Sand and Gravel Co., Custer, Wis., 100 shares at \$100 each. J. G. Goetz, G. T. Goss and R. C. McMahon.

Polgrim Sand and Gravel Corp., Farmingdale, N. Y., increased capital stock from \$20,000 to \$60,000.

Victoria Tile and Cement Co., New York City, 500 shares. A. W. Lichtenstein, 545 Fifth Ave., New York City. To produce building materials.

Maple Leaf Marble Quarries, Ltd., Toronto, Can., 10,000 shares preferred, par value \$25 each, and 200,000 no par value common shares.

Plas-A-Tone, Inc., Milwaukee, Wis., 100 shares at \$25 each. M. J. Murray, M. M. Murray and H. Oline. To deal in stone, cement, etc.

Quarries

Huddleston Quarry, De Witt, Mo., has recently increased operations.

Kelley Island Lime and Transport Co., Cleveland, Ohio, has opened the limestone quarries on Kelley's Island which have been closed all spring.

Interstate Granite Corp., Charlotte, N. C., will erect a \$100,000 granite plant to be in operation October 1.

Great Western and Holly Sugar companies have contracted for lime rock from the quarry north of Greybull, Wyo., to use in their refineries.

Bertolini Bros., New Haven, Conn., have purchased the stone crushing plant of William T. Tracy, Lee, Mass.

Thompson-Weinman and Co., Inc., Cartersville, Ga., recently furnished a picture of a scene in its quarry which was used in the rotogravure section of the Atlanta Journal.

Anna Stone Co., Anna, Ill., has resumed operations. The plant supplies road stone and fertilizer, the demand for which is reported as increasing recently.

Columbia Marble Co. of Atlanta, Ga., and Knoxville, Tenn., is installing new machinery at its plant in Marble, N. C., preparatory to developing large marble quarries recently acquired by it.

Southern Limestone Products Co., Cordele, Ga., has been given a contract for 900 cars of its product to be used in Early county by the state highway department.

Laura Gravel and Stone Co., Phillipsburg, Ohio, recently was given some excellent publicity through a news story which appeared in the Dayton, Ohio, Journal.

Travertine Quarries, Inc., Sarasota, Fla., will install \$20,000 worth of machinery and develop 120 acres, according to a report of L. J. Larson, secretary and treasurer.

Taylor Stone Co., Ada, Ohio, is building a new plant directly across the road from the one which burned recently. Three shifts of men are stripping the soil from the new quarry and two shifts of carpenters are at work on the new plant.

Hudson River Stone Co., North Hempstead, L. I., N. Y., has purchased a 17-acre peninsula which juts into the Hudson river north of Cold

Spring. Although it has been reported that the state has bought Taurus mountain, which this company purchased in the spring, more recent reports are that the company still has the mountain and will quarry there for trap rock.

Sand and Gravel

Scranton Sand Co., Wayland, N. Y., has been dissolved.

Pittsburgh, Penn. The dredge Rebecca of the McCrady-Rodgers Co. is digging sand and gravel at Baden, Penn.

Klinker Sand and Gravel Co., Seattle, Wash., is spending about \$1000 for a ramp and hopper at its plant.

Blackhawk Sand Co., Ottumwa, Ia., recently was described in the local paper. The story told of the history and the operation of this company.

William Worthington, Blue Rapids, Kan., has given up his garage and will devote all his time to the gravel business.

William Atkinson, Monroe, La., former commissioner of streets and parks, is now affiliated with the retail department of the Twin City Gravel Co.

Champion Gravel Co., Pound, Wis., has closed down permanently. All machinery and rigging are being moved to a location near Iron Mountain, Mich.

Missouri Gravel Co. has sent a fleet of barges from Moline, Ill., to its plant at La Grange, Mo. Operations have been started at the La Grange plant.

Appleton, Wis. Bids for gravel to be used on road work opened recently were rejected because the committee was not satisfied with the quality of gravel offered by the low bidder.

Riverside Service Gravel Co., Riverside, Calif., has been awarded contract for excavation and furnishing sand and stone for the new Rubidoux bridge.

Houghton, Mich. The Houghton county gravel crushing plant, which has been located near Hancock park, is being moved to Calumet, where it will be for the remainder of the summer.

Tennessee Valley Sand and Gravel Co., Sheffield, Ala., has been given a contract for 1000 cars of sand and gravel to be used on the Missionary Ridge road at Chattanooga. A large dredge, towboat, quarterboat and several barges have been moved to this operation and are now at work on the contract.

Cement

Colorado Portland Cement Co., Denver, Colo., has closed its Portland, Colo., plant indefinitely. Shipments of cement will be made from the stock now on hand.

Green Bag Cement Co., Pittsburgh, Penn., announces the appointment of L. N. Bryant as superintendent of its plant. Gayle N. Davis, formerly of the Hawkeye Portland Cement Co., Des Moines, Ia., has been appointed chief chemist.

Des Moines, Ia. More than 5,050,000 bbl. of cement were used in the construction of primary highways in the year ending June 30. Over 4,425,000 tons of sand, gravel and crushed stone was also used.

Columbus, Ohio. Many owners of property abutting East Main street, where the 50-ft. superhighway will be built, are planning to appeal to the council to pave the street inside the city with concrete instead of brick.

East Liverpool, Ohio. Large consignments of cement and tar are being transported on the Ohio river from Aliquippa, Hazelwood and Brunot's island to Parkersburg, W. Va., for use on state road construction.

Universal Atlas Cement Co., Chicago, Ill., was recently described in a news story by John M. Ward of the Birmingham, Ala., Industrial Board. The growth of the company and its particular development with the Birmingham district was described in some detail.

Hawkeye Portland Cement Co., Des Moines, Ia., has given ground for a school building to the city school board. Contracts have been awarded by the city for a new school house. It is reported that a reduction in forces at the plant as well as a reduction in wages has been made by the company.

Lime

Sewell Lime Co., Orofino, Idaho, has burned some stone in a kiln erected for experimental purposes and the results have been so satisfactory that other kilns will be erected soon.

Cement Products

Buffalo Cement Burial Vault Co., Inc., Buffalo, N. Y., is planning to rebuild part of plant recently destroyed by fire with loss of about \$40,000.

Carl B. Warren of the Spokane Concrete Pipe Co., Spokane, Wash., is building a new home. Among other interesting details of the house will be a tile floor placed on concrete slabs.

Boise Cement Products Co., Boise, Idaho, announces the election of J. C. Anduiza, president, Charles A. Nelson, vice-president, J. T. Hansen, secretary-treasurer, and James Repp and Ed Lesinger, directors. Earl M. Biddle of Knoxville, Tenn., has been retained to assist in sales and promotion.

Northwest Concrete Products Association held its mid-summer meeting at Gearhart, Ore., July 17 and 18. The following members attended: Carl M. Warren, manager Spokane Concrete Products Co., president of the association; W. H. Sharp, manager Longview Concrete Pipe Co.; E. L. Warner, manager E. W. Harrison Pipe Co., Tacoma; J. J. Collins, manager Collins Concrete Pipe Co., Portland; W. F. Paddock, Concrete Pipe Co., Seattle, and affiliated companies; M. E. Henderson, manager Bellingham Concrete Products Co., Astoria; L. S. Shew, manager Renton Cement Products Co., Renton, Wash.; Howard A. Hall, sales manager Eugene Concrete Pipe Co., Eugene, Ore.; W. J. MacKenzie, Concrete Pipe Co., Portland; John W. Ash, Builders Supply Co., Corvallis, Ore.; Frank J. Barrett, district manager, Portland Cement Association, Seattle; C. M. Howard, sales engineer identified with a group of western Washington member products plants; and W. A. Scott, Portland, "Concrete Products."

Miscellaneous Rock Products

Owens-Illinois Glass Co. will build a \$1,000,000 glass factory at Alameda, Calif.

Norman Ferguson, Vernon, B. C., is building a one-story frame cement brick plant costing about \$10,000.

James H. Rhodes and Co., Chicago, has filed an application asking for an increase in the duty on wholly or partly manufactured pumice stone.

Magnolia Fertilizer Co., Seattle, Wash., is constructing a one-story frame addition to its present fertilizer plant.

Standard Slag Co., Hubbard, Ohio, will be one of six recipients of bronze trophies awarded by the manufacturers' association of Ohio in October for its safety record the past three months.

Whitehill Co., Inc., Manchester, Conn., having charge of mining and manufacturing operations of Bon Ami Co., advises that while company is doing some mining in North Carolina, it has no intention of increasing operations there.

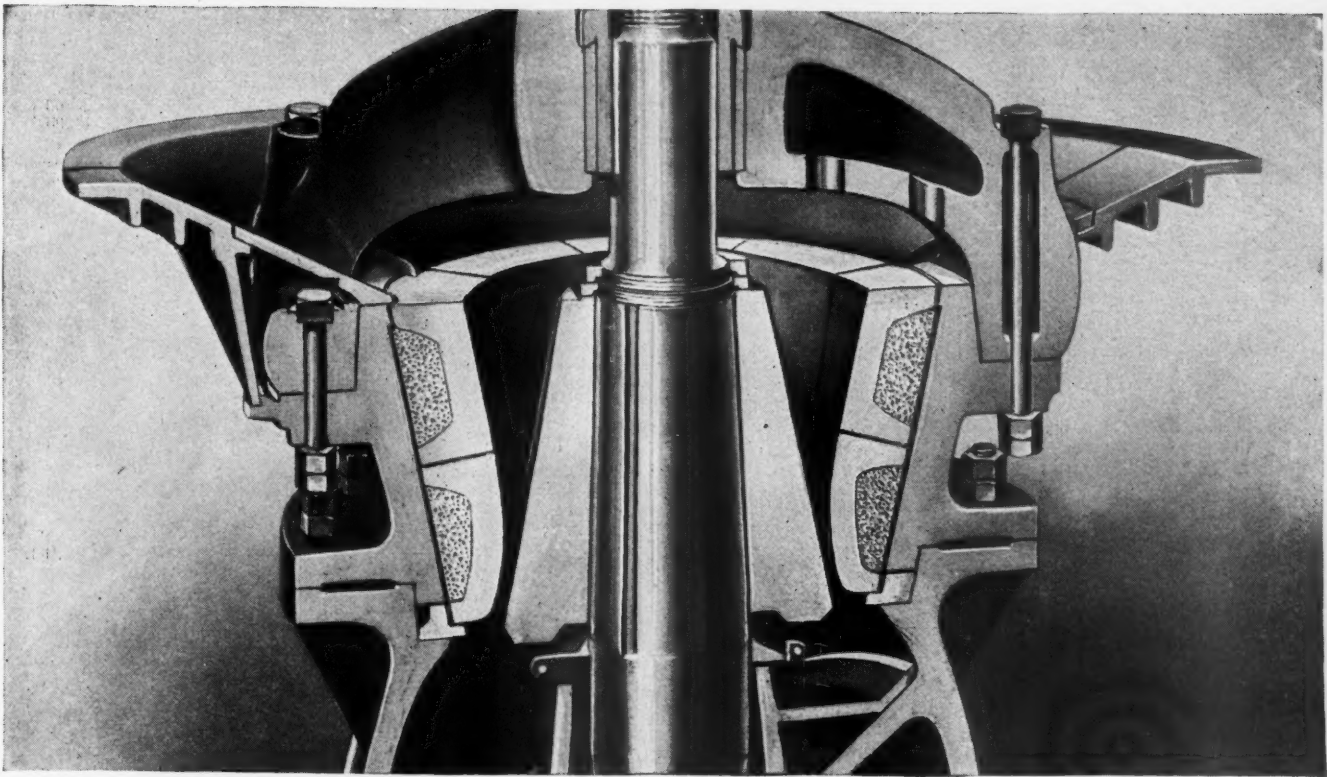
Adirondack Mining Co., Gouverneur, N. Y., has taken over talc deposits heretofore held by Mr. Sprague, organizer. Plans are under way for development of properties, including installation of mining machinery and power equipment.

Krebs Pigment and Color Corp., Wilmington, Del., is being organized as a joint interest of E. I. du Pont de Nemours and Co., Wilmington. Grasselli Chemical Co., Cleveland, and Commercial Solvents Corp., New York. The consolidated organization will operate plants at Newport, Del., Newark, N. J., and Baltimore, Md.

Personals

Ellwood Riesing, Milwaukee, Wis., has returned after spending a year and a half in Russia as representative of the Chain Belt Co.

C. B. Condon, general manager of the Hawkeye Portland Cement Co., Des Moines, Ia., has been



Non-Choking Concaves

..... give Greater Capacity—
and Lower Maintenance

The capacity of your old crusher, Gates, McCully, or any other gyratory type can be increased by installing a set of the new Allis-Chalmers Non-Choking concaves.



Products of Allis-Chalmers

Complete equipment for crushing, screening, and cement plants; mining and metallurgical plants;—jaw, gyratory and roll crushers; rotating and vibrating screens; multi-roll sizers; elevators, and hoists; washing equipment; motors, pumps and Texrope Drives.

Write for a bulletin on Allis-Chalmers crushing plant equipment.

—Special Heads Not Required—

The principal advantages of the new concaves are: approximately 50% greater capacities at close settings; possibility of "choking" and "stalling" greatly reduced; present minimum settings may be decreased from 25%-35% without reducing eccentric throw; wear is more uniformly distributed, thus eliminating "grooving" of head at crushing point; due to uniform wear, head does not have to be adjusted or concaves reset as frequently; power consumption and peak loads formerly obtained at close settings are greatly reduced; more uniform product and less objectionable fines than with old concaves at fine settings.

These new concaves differ from all other types, in that if the crushing head is in fair condition you can install new Non-Choking concaves without purchasing a new head. They are further described in Leaflet 2132.

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

When writing advertisers, please mention ROCK PRODUCTS

appointed a member of the governor's unemployment committee.

Frank Bagentose and **Clifford Wilson**, two Cincinnati, Ohio, cement salesmen, are the recent heroes who captured an 18-ft. python that had been terrorizing mariners of the Sandusky, Ohio, port.

Col. W. C. Bickford, president of the Queen Anne Sand Co. and the Seattle Construction Council, Seattle, Wash., has been appointed a member of the board of public works by Mayor Robert H. Harlin.

W. W. Fischer, president of the Fischer Lime and Cement Co., Memphis, Tenn., was a member of the committee which visited Washington in the interest of the development of the Wolf river project.

W. W. Johnson of the Olympia Concrete Products Co., Olympia, Wash., spoke recently at the weekly meeting of the Kiwanis club on the development of portland cement and its present-day uses.

Robert Jerrard, formerly superintendent of the Calcite quarry of the Colorado Fuel and Iron Co., has been appointed superintendent of the Monarch quarry. **J. Roy Rennie**, former chief clerk of the quarry at Lime, has been appointed clerk of the Monarch property.

R. M. Gattshall, advertising manager of the Republic Rubber Co., Youngstown, Ohio, has been granted a leave of absence for one year to accept the position of executive manager of the joint merchandising committee of the Triple Supply and Machinery Association. The association consists of the American Supply and Machinery Manufacturers Association, the Southern Supply and Machinery Distributors Association, and the National Supply and Machinery Distributors Association.

Obituaries

James Mason, 53, Murray City, Ohio, was killed by a fall of stone in a quarry at Athens, Ohio, July 16.

Lee D. Smith, 45, employe of the Superior Portland Cement Co., died July 8, a few hours after he had fallen 50 ft. at the company's plant. Company officials said Smith was making some repairs when he slipped and fell.

Manufacturers

Bayley Blower Co., Milwaukee, Wis., has passed into receivership and G. C. Bush has been appointed receiver.

Gardner-Denver Co., Quincy, Ill., announces the appointment of the Texas Contractors Supply Co., Waco, Tex., as Texas distributors.

Hodge Sales Corp., New York, N. Y., announces its new office at 11 Park Place, effective June 30.

Union Chain and Manufacturing Co., Sandusky, Ohio, announces that E. O. Williams, formerly manager of the Howe Chain Co., has been placed in charge of its Philadelphia office.

Grindle Fuel Equipment Co., Harvey, Ill., announces that improvements have been made in the Whiting Table-Roller Pulverizer recently acquired by it and formerly known as the Bethlehem Table-Roller Pulverizer.

Chain Belt Co., Milwaukee, Wis., announces the appointment of the Vermont Road Equipment Co., Montpelier, as distributor in Vermont and the Northwest Machinery Co., Boise, Idaho, as distributor in Idaho.

Meriam Co., Cleveland, Ohio, announces that H. R. Bowers, formerly with the Bailey Meter Co., is now manager of sales and advertising. It also announces the appointment of the Anderson Engineering Co., New Haven, Conn., Leonard Maleson Co., Philadelphia, Penn., and S. D. Shook and Co., Pittsburgh, Penn., as exclusive representatives in their respective territories.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., announces the appointment of T. J. Pace as assistant to the vice-president in charge of general market planning and research analysis; M. B. Lambert as sales manager in charge of transportation department; O. F. Stroman, sales manager in charge of industrial department, and R. A. Neal, sales manager in charge of central station department.

Manganese Steel Forge Co., Philadelphia, Penn., announces the appointment of J. G. Logan, Knoxville, Tenn., as distributor in Tennessee, North Carolina, South Carolina and Georgia; S. L. Morrow Engineering Co., Birmingham, Ala., as distributor in Alabama, northern Mississippi and western Florida; C. T. Patterson, New Orleans, La., as distributor in Louisiana and southern Mississippi; and C. H. Collier, Dallas, Tex., as distributor in Texas.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention **Rock Products**.

Machine Vibration. Bulletin tells how to reduce noise and vibration of machinery with cork mats. **L. MUNDET AND SON, INC.**, New York, N. Y.

Chilled-Iron Castings. Four-page bulletin describes "Elverite" castings used as tube-mill liners and as parts for crushing and grinding equipment. **FULLER LEHIGH CO.**, New York, N. Y.

Motor Bearings. Steel-backed babbitt bearings is the title of booklet discussing bearing seizure in electric motors. **WAGNER ELECTRIC CORP.**, St. Louis, Mo.

Reduction Crusher. Broadside describes features of the T-Z reduction crusher. **TRAYLOR ENGINEERING AND MANUFACTURING CO.**, Allentown, Penn.

Wire Screening, Cloth and Netting. Specifications on many types of wire cloth, netting and screening are given in new general catalog. **JOHN A. ROEBLING'S SONS CO.**, Trenton, N. J.

Conical Mill and Dryers. Four-page bulletin gives current data on the 10-ft. Hardinge conical mill and Ruggles-Coles dryers. **HARDINGE CO.**, York, Penn.

Power Units. Reprint from Marine Engineering and Shipping Age describes construction of the G. Harrison Smith, a new tanker recently completed for Standard Oil service. **DE LAVAL STEAM TURBINE CO.**, Trenton, N. J.

Excavating Equipment. The May-June issue of "Center Drive" illustrates many jobs on which Lorain shovels are operating. Material production and construction work are featured. **THEW SHOVEL CO.**, Lorain, Ohio.

Preloaded Ball Bearings for Precision Spindles. Bulletin 203 discusses preloaded ball bearings as used in various applications. Details of their application in high-speed grinders are given. **SKF INDUSTRIES, INC.**, New York, N. Y.

Motor Vehicle Brake Service. Bulletin SD-338 invites owners and operators of motor vehicles to avail themselves of Wagner's factory brake service branches and franchised brake service companies. **WAGNER ELECTRIC CORP.**, St. Louis, Mo.

Concrete Products Equipment. "Besser Tappings" describes plant of the Cinder Concrete Units Corp., Boston, Mass. Also illustrates and describes the new Besser super-stripper. **BESSER MANUFACTURING CO.**, Alpena, Mich.

Worm Gear Speed Reducer. Information on selecting suitable reducers for particular applications is contained in new book. Photographs of applications are shown. **W. A. JONES FOUNDRY AND MACHINE CO.**, Chicago, Ill.

Nickel and Alloys. Two lists give bibliography of available literature on nickel and its alloys. Brief abstracts of this literature are given. **INTERNATIONAL NICKEL CO., INC.**, New York, N. Y.

Pulverizers and Classifiers. Pamphlet illustrates and gives brief description of various types of pulverizers and of classifiers, all of which are used in rock products field. **BRADLEY PULVERIZER CO.**, Allentown, Penn.

Vibrating Screens. Bulletin 80 describes the detailed construction of "Gyrex" screens. Various applications are illustrated. Specifications of all sizes are shown. **ROBINS CONVEYING BELT CO.**, New York, N. Y.

Tubular Air Heaters. New bulletin describes a vertical tubular air heater. Details of the heater are described and illustrated. Typical installation views and setting plane are shown. **BABCOCK AND WILCOX CO.**, New York, N. Y.

Churn Drills. Catalog explains the operation of churn drills. Test information on churn drills is given. Numerous jobs are illustrated of different types of work. **SANDERSON CYCLONE DRILL CO.**, Orrville, Ohio.

Heavy-Duty Apron Feeders. Booklet 1351 gives many tables and drawings to assist in selection of proper width of apron, pitch of chain, sprocket sizes, head shaft size, etc. **LINK-BELT CO.**, Chicago, Ill.

Quarrying and Mining Service Truck Bodies. Bulletin 40 illustrates "WonWay" and "Phoenix" truck bodies designed for quarry truck haulage. A table gives a digest of data secured from 25 quarry truck operations. **EASTON CAR AND CONSTRUCTION CO.**, Easton, Penn.

Steam Generator. Catalog SG-1 illustrates and describes the design and application of the Combustion steam generator, a single unit embodying in an integral design those elements required in the production of steam. **COMBUSTION ENGINEERING CORP.**, New York, N. Y.

Excavators. Catalog gives detailed illustrations and descriptions of many parts of Koehring No. 401 shovel-pull shovel-crane-dragline. Specifica-

tions are included. Radius diagram and crane load diagram are shown. **NATIONAL EQUIPMENT CORP.**, Milwaukee, Wis.

Pyrometer. Catalog 1101 outlines nature and field of the potentiometer principle as applied to pyrometry, shows how this is incorporated in the new Brown Potentiometer Pyrometer, and describes its features. **BROWN INSTRUMENT CO.**, Philadelphia, Penn.

Spiral Welded Pipe. Handbook on Armo spiral welded pipe contains specific information for user of specially designed pipe from 6 to 24 in., with a variety of wall thicknesses. Detailed specifications and tables on capacities, etc., are shown. **AMERICAN ROLLING MILL CO.**, Middletown, Ohio.

Forge Welded Pipe. Catalog 31 contains detailed data on large diameter forge welded pipe. Numerous charts and tables are shown. Information on design and particular adaptations of joints for large diameter pipe are given. **TAYLOR FORGE AND PIPE WORKS**, Chicago, Ill.

Applied Photography. July issue of Applied Photography tells how to improve photographic effects. Two illustrations supplied by Stephens-Adamson Manufacturing Co. illustrate effective use of photography in selling vibrating screens. **EASTMAN KODAK CO.**, Rochester, N. Y.

Portable Compressors. New 32-page bulletin PC4 illustrates and describes various sizes and mountings of compressors. Features described include forced feed lubrication with filtered oil and automatic control. **GARDNER-DENVER CO.**, Quincy, Ill.

Elevating and Conveying Machinery. A 100-page catalog gives useful information for the selection of elevating and conveying machinery. Belt conveyors, storage silo systems, bucket elevators, spiral conveyors, skip hoist installations, etc., are described. **FAIRFIELD ENGINEERING CO.**, Marion, Ohio.

Pulverized Coal Burner. Bulletin 905 describes the application, construction and operation of the Fuller Lehigh circular burner, a pulverized coal burner of the turbulent type used for firing pulverized coal through solid refractory walls with a minimum of alterations. **FULLER LEHIGH CO.**, New York, N. Y.

Ball and Roller Bearings. Sixteen-page booklet gives detailed information on SKF ball and roller bearing pillow blocks and shaft hangers. Specifications and dimensions of a large number of bearings for normal and heavy-duty work are given. **SKF INDUSTRIES, INC.**, New York, N. Y.

Sling Chains. Book gives complete information on standard type of sling chains. Specifications, definitions and suggestions on purchase and use of chains are given. A chart also shows safe working loads of iron sling chains when used at various angles. **AMERICAN CHAIN CO., INC.**, Bridgeport, Conn.

Refractory Cements and Plastics. Booklet describes various refractory cements and plastics manufactured by the company and outlines uses and methods of application. Tests, such as setting, cracking and shrinkage, are described and illustrated. **BABCOCK AND WILCOX CO.**, New York, N. Y.

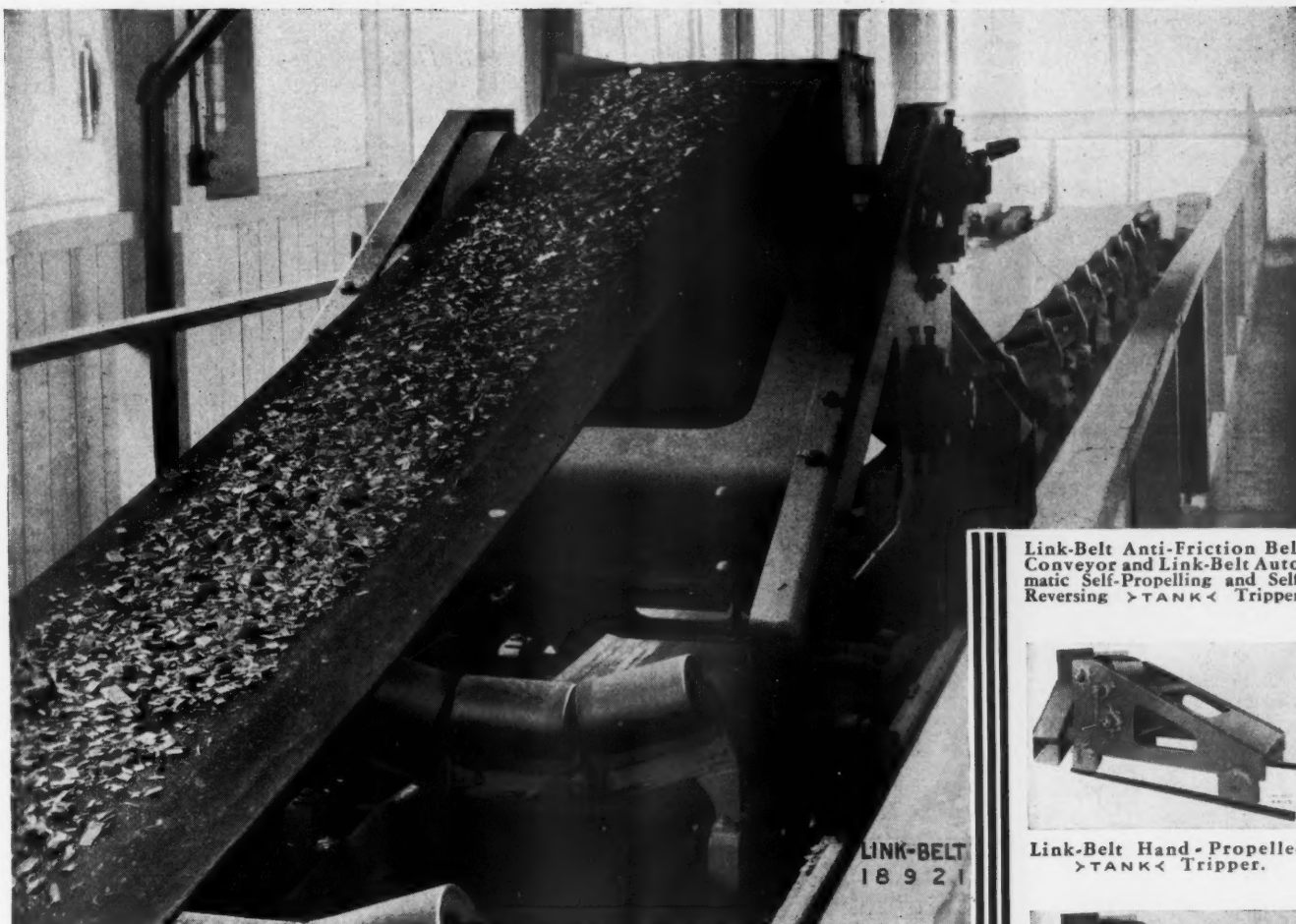
Grinders and Pulverizers. Booklet gives information on Stedman two-stage swing and hammer mills. Detailed construction illustrations are shown. Information on installations is included. Specifications and capacity on different products are given. **STEDMAN'S FOUNDRY AND MACHINE WORKS**, Aurora, Ind.

Portable Compressor. Bulletin 755 illustrates and describes a 360 cu. ft. per min. compressor said to permit use of an additional number of units. Bulletin 797 describes the complete line of CP portable compressors from 72 to 280 cu. ft. capacity. **CHICAGO PNEUMATIC TOOL CO.**, New York, N. Y.

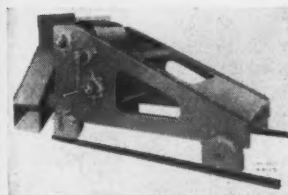
Vacuum Pump. Catalog shows travel of the air, condensate and water through the "Condo-Vac" vacuum pump. Installation diagrams, details of pump construction, specifications and engineering data are given in complete detail. Announcement is made of an automatic alternator for duplex vacuum pumps. **CHICAGO PUMP CO.**, Chicago, Ill.

Turbo-Blowers and Compressors. Bulletin 3132 illustrates and describes construction and operation of single-stage and multi-stage blowers for discharge pressure of 1 to 40 lb. and capacities of 3000 to 100,000 cu. ft. per min., and turbo-compressors for discharge pressures up to 110 lb. and capacities of 8000 to 10,000 cu. ft. per min. **INGERSOLL-RAND CO.**, New York, N. Y.

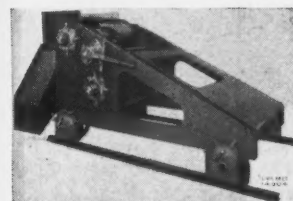
Pumps and Ejectors. Specification sheet W-310-S12A describes centrifugal pump types CA and CB; specification sheet W-319-S3 describes centrifugal pumps type WF; specification sheet L-711-S3 describes dry vacuum pumps, two-stage; specification sheet W-112-S15 describes horizontal duplex pot type, piston pattern pumps for oil; specification sheet W-205-B1 describes steam-air ejectors for stationary and marine service. **WORTHINGTON PUMP AND MACHINERY CORP.**, Harrison, N. J.



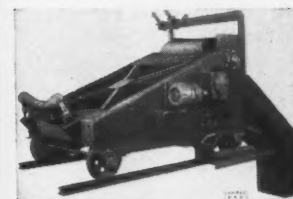
Link-Belt Anti-Friction Belt Conveyor and Link-Belt Automatic Self-Propelling and Self-Reversing >TANK< Tripper.



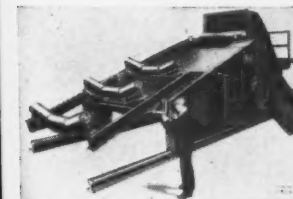
Link-Belt Hand-Propelled >TANK< Tripper.



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